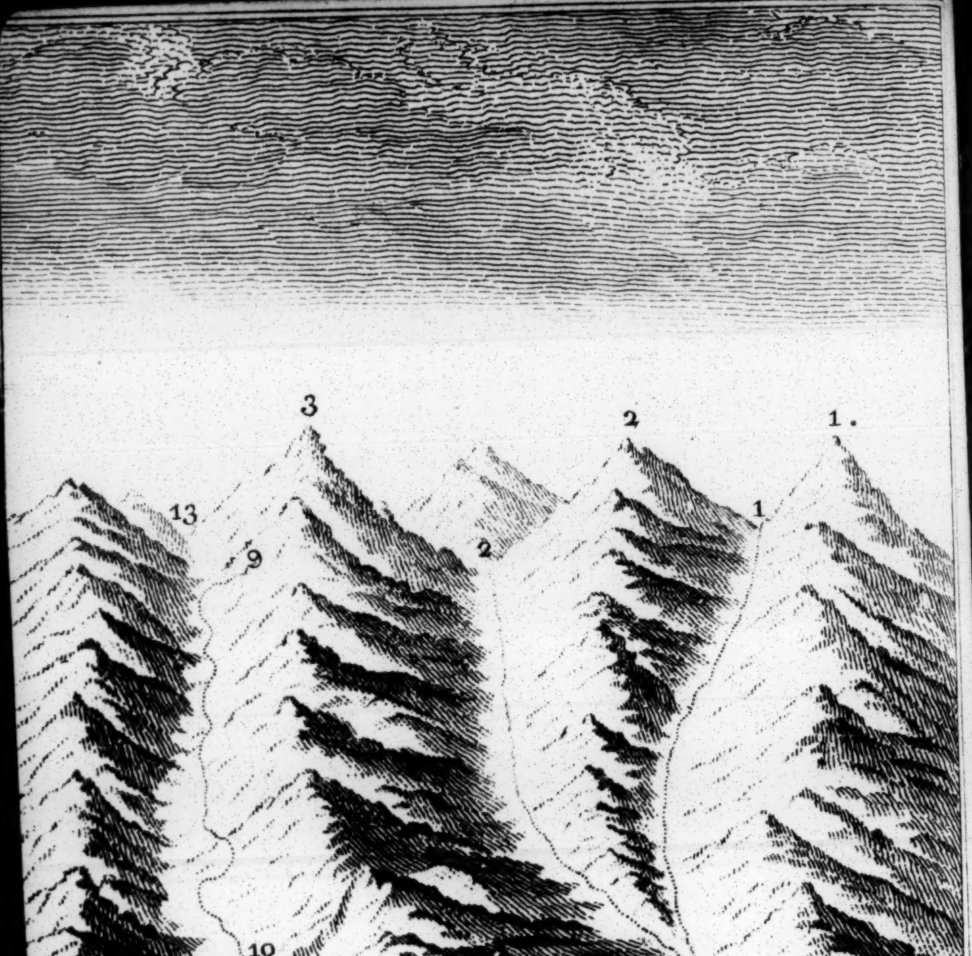

H Roberts Sculp.

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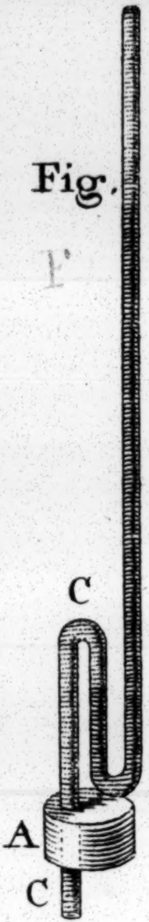
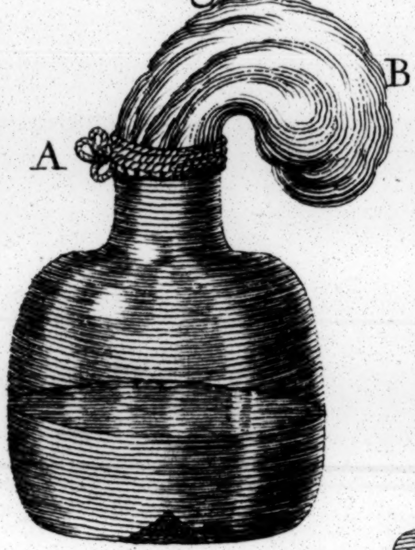
Plate II.

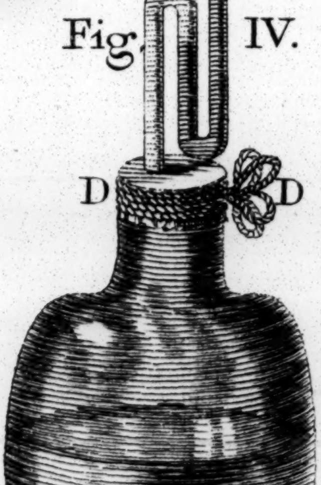
Fig, III.



Fig, I.



Fig, IV.



Fig, II.

H. Roberts Sculp.

A TRUE AND PARTICULAR ACCOUNT, OF THE Moſt Surpriſing PRESERVATION, AND HAPPY DELIVERANCE, OF Three WOMEN who were BURIED, Thirty-Seven Day's, in the RUINS of a STABLE, by a heavy Fall of SNOW, from the Mountains, at the Village of *Bergemoletto*, in *Italy*.

With CURIOUS REMARKS.

BY IGNAZIO SOMIS, K

Profeſſor of Phyſic in the Univerſity of TURIN, and
Phyſician to his Sardinian Majeſty.

TRANSLATED FROM THE ITALIAN.

LONDON,

Printed for H. SERJEANT, at the BLACK-SWAN, without TEMPLE-BAR, 1768.

Price Bound, Three Shillings.

BRITISH MUSEUM

TO HIS

SACRED MAJESTY

CHARLES EMMANUEL

King of SARDINIA, &c.

IGNAZIO SOMIS.

I MOST humbly preſent to your ſacred Majeſty a compoſition, which derives its ſole merit from that important commiſſion, with which you were pleaſed to honour me, at the time when you moſt graciouſly reſigned your invaluable health to my care. And can there be an object more dear and more ſacred to thoſe people, whom heaven has bleſſed with the happineſs of living under a government, ſo conſpicuous for the moſt impartial adminiſtration of juſtice, together with a diſplay of that wiſdom, by which king's reign, and the mighty are rulers of the earth? The whole world knows with, what a benign

benign aſpect, your majeſty amidſt the other moſt weighty concerns of this happy ſtate, looks down on the arts and ſciences, which have made ſo flouriſhing a figure ever ſince your auſpicious reign. Juſtly then may a faithful ſubject hope, that ſince he has been ſo fortunate as to be appointed in this Royal Univerſity, to the honourable poſt of cultivating thoſe arts, ſo dear to your Majeſty, you will condeſcend to accept of this little performance,

ance, which with the profoundeſt reſpect, I dedicate to your Majeſty, to whom it owes its exiſtence, begging you will take it together with the author under your auguſt patronage.

ADVERTISEMENT.

THE tranſlator has no occaſion to mention any thing by way of preface to the following performance. Its reputation is ſufficiently eſtabliſhed, not only in Italy, but likewiſe in England, where it has met with the higheſt approbation. He only begs the indulgence of the public for the liberty he has taken, in retaining a few words from the Italian, as *Valanca, Foreſta,* for want of proper terms in Engliſh to expreſs their ſignification.

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⁂ There is a remarkable Letter in this Work relating to Matrimony.

AN

ESSAY, &c.

IN the preſent age, there is not, I ſuppoſe, any one to be found, who, having cultivated the natural ſciences, and read ſuch authors, as have contributed to carry them to that height, which they now enjoy, is not thoroughly perſuaded of this great truth, that the ſafeſt and eaſieſt way to exalt them to their zenith, is firſt to make oneſelf thoroughly acquainted with what has been already diſcovered by induſtrious, attentive, and exact obſervers, and then to add to this knowledge new, diligent, and repeated experiments. In fact, difficult as it may be to attend more to the naked truth of things, than to the authority of thoſe who ſpeak of them, and to forget thoſe maxims which we have, as it were, ſucked in with our milk; yet we may obſerve, that thoſe opinions, which formerly had taken deep and firm root in the minds of philoſophers, and became interwoven, in a manner, with their frame and conſtitution, are now become ſtale and obſolete, to the great advantage of true philoſophy. Such are theſe, that we ought blindly to ſwallow every thing delivered by thoſe, who for many ages have tyrannized in the ſchools of philoſophy, and triumphantly drawn after them the brighteſt geniuſes; that we ſhould never ſcruple peremptorily to aſſign certain principles, by which all the operations of nature, within our obſervation, may be explained; that to confeſs ingenuouſly our not being able to diſcover ſure and ſolid reaſons for every thing, is highly unbecoming a philoſopher; with others of the

the ſame ſtamp. So that whoever ſhould unhappily let any of them eſcape him, might deſervedly expect the following reply of the Florentine poet.

"What! you imperiouſly require
"That I ſhould fetter my underſtanding,
"And not let it range farther than you can
"ſee it.
"Whoever gives himſelf any trouble a-
"bout theſe trifles,
"No longer can be ſaid to aim at truth;
"But wants to keep up the value of theſe
"jewels,
"Which being falſe, expoſe the wearer
"to the contempt of him
"Who wears true ones, and are them-
"ſelves brought into diſrepute
"By being compared with thoſe of real
"value."

Wherefore, the lovers of truth and wiſdom, fully perſuaded that we are not blindly to follow the opinion of others, nor to deviſe and invent reaſons for things, but to examine every work of nature with a clear and penetrating eye, have laid it down as a maxim, built upon experience, that to inveſtigate the cauſes of any particular phenomenon, we ſhould be firſt certain of the exiſtence of ſuch phenomenon; and that there is no attaining ſuch certainty, without obſerving all the moſt minute circumſtances, which eſtabliſh that exiſtence, and let us into the nature of the thing itſelf. What judgment could a man form of the bodies which ſurround us, and ſo beautifully adorn the univerſe with their different colours, whoſe organs of ſight were ſo vitiated, as not to be ſuſceptible of the images formed by the rays of light flowing from them. We hear, and we read that ſeamen can eaſily diſcover, at forty miles diſtance, eſpecially by night, the ſhores of Spain, Ceylon, Sumatra, and other countries, merely by the different odours emitted by thoſe countries; a degree of acuteneſs thoſe muſt never pretend to, in whom, through any diſorder or defect in their organs of ſmelling, the very ſubtil particles exhaled by odorous bodies cannot excite the preciſe kind of motion neceſſary to produce ſuch a ſenſation. The ſame may be ſaid of the other ſenſes, concerning which, as well as the proper objects of them, thoſe, in whom the reſpective organs are not ſound and perfect, muſt not pretend to judge. To reaſon, therefore, with ſucceſs upon any ſubject, it is firſt neceſſary to aſcertain, by exact obſervation, all the properties belonging to it; and he, who ſhall have thus aſcertained moſt of theſe properties, may, by comparing them together, expect to ſee fartheſt into the reſt. Hence it is evident, that to philoſophize with judgment, nothing is ſo indiſpenſably requiſite, as obſervation and experiment, to which, however, we are not to refuſe the aſſiſtance of our reaſon, when the ſubject will admit of it.

It was by this reſplendent light that Galileo, Torricelli, Bacon, Boyle, and Newton, not to mention many other able and illuſtrious philoſophers, directed all their inquiries, boldly leaving the footſteps of thoſe who went before them, who were for deciding every queſtion, and explaining every phenomenon by vain and groundleſs hypotheſes. They, on the contrary, ſoberly ſat down to conſider and examine, with the greateſt caution and circumſpection, the works of nature in every light in which they could be conſidered and examined, whereby they diſcovered a vaſt country, and opened a direct and ſecure road to the golden manſions of pure and genuine truth. This light ſoon diffuſed itſelf over all the other ſciences, which either derive their origin from phyſics, or are intimately and indiſſolubly connected with them. Nor is this all, for theſe ſciences have acquired a new aſpect, and received conſiderable encreaſe and improvement from the many obſervations and experiments made upon their immediate objects. How much, for inſtance, is not natural hiſtory indebted to the great diligence and experimental inveſtigation of the incomparable Malpighi, whoſe name will flouriſh in the minds of men, while there remains in them the leaſt fondneſs for noble and uſeful knowledge. What a great revolution has been brought about in the theory of medicine, by the important obſervation of Hervey to aſcertain the circulation of the blood, barely hinted at by thoſe who went before him. The theory of reſpiration has been greatly illuſtrated by the obſervations of Swammerdam, upon which new light has been ſince thrown by the famous Haller, to whom medical hiſtory, anatomy, phyſiology, and every other branch of the healing art are ſo much indebted. Who would have thought, that almoſt all bodies are phoſphorous, if that diligent and indefatigable experimenter, Beccari, had not evidently proved it by repeated obſervations. I ſhall not mention many other great men of Italy, England, France, and other countries, who in the paſt and the preſent centuries, have, to their own immortal honour, and the unſpeakable advantage of thoſe engaged in ſuch ſtudies, moſt carefully obſerved and examined ſome one ſubject, and ſome another, and by means of ſuch obſervation, happily placed them in that point of light to which the weakneſs of human underſtanding is allowed to aſpire.

It is intirely to the deſire of coming at truth by ſuch methods, that we are to attribute the inſtitution and flouriſhing condition of thoſe glorious and renowned aſſemblies of able and learned men in ſo many cities of Europe. I mean their academies. Theſe great men, accuſtomed never to truſt the eyes of others, nor even their own, till they had obſerved, and tried, and again tried and obſerved, began towards the middle of the ſeventeenth century to aſſemble together in Florence; and at length, animated by the princely liberalities and munificence of prince Leopold, afterwards cardinal of Medicis, and of the great duke Ferdinand II. both admirers and patrons of the ſciences and fine arts, inſtituted the academy del Cimento. In 1667, they publiſhed *i ſaggi di naturali eſperienze*, written with ſingular chaſtity and elegance of ſtile, by count Lorenzo Magalotti, and lately tranſlated into Latin, by that learned Dutchman Muſſchenbrock, which will remain to lateſt poſterity ſo many teſtimonies of Italian diligence, penetration, and preciſion, in making experiments. And indeed there is ſeldom any thing more wanting, to leave the Italian geniuſes no room to envy other nations, than an exemption from the drudgeries of common life, and ſuch further rewards and encouragements as might make them exert thoſe ſingular talents beſtowed on them by providence, and indefatigably aſpire to great things. In the ſame manner, and nearly at the ſame time, with the academy of Cimento, ſtarted up in England the Royal Society, in Paris the Royal Academy of Sciences, in Germany that of the *Curioſi Naturæ*, the academies of Berlin, Up-ſal, Peterſburgh, and Gottingen. Theſe were followed, in the beginning of the preſent century, by our Inſtitute and academy of Bologna. An ardent thirſt for knowledge brought together in the houſe of doctor Sandri, the following learned men, viz. Stancari, Morgagni, the three Euſtachios, and the two Manfredis, a family no leſs qualified than that of the three Zanottis, to render their country illuſtrious; a taſte and genius for learning being ſo natural to them, that even the women have excelled in the mathematics or belles lettres. The fame of this aſſembly, ſoon made its way over the Alps, and theſe bright and penetrating geniuſes were taken notice of by a nobleman, fond of the ſciences, and zealous for the honour of his country, who requeſted them, to the great concern of doctor Sandri, to make uſe of his houſe, and meet there ſome days in every week, as they might be able more conveniently to confer with each other, and communicate their obſervations, and diſcoveries. This happened in 1705. This nobleman was count Marſigli, known to the republic of letters by his expenſive works, which prove him to have been a man of uncommon parts and learning, eſpecially in natural hiſtory. The count, unwilling that ſuch uſeful diſcoveries, made in his own houſe, ſhould any longer remain in obſcurity, prevailed on the pope, and the ſenate of Bologna, to patronize and promote an inſtitution, which ſo indefatigably cultivated the ſciences. The conſequence was that the inſtitute was erected and eſtabliſhed in 1712, and opened for the firſt time with a great concourſe of all ranks, the thirteenth of March in the year 1714. So learned an academy, ſurely, will never forget the ſplendid magnificence of that nobleman, who beſtowed upon it a very large and moſt valuable collection of natural curioſities, with inſtruments and machines made by him in his extenſive travels, and brought together with infinite expence. I have often had an account of this happy eſtabliſhment, from my moſt amiable maſter the Abate Gerolamo Tagliazucchi, who was not only a profound mathematician and philoſopher, and an excellent orator and poet, but likewiſe a zealous and indefatigable promoter of the ſciences and polite arts. Whoever knows what gratitude is, muſt readily conceive how bitterly I do and ſhall always regret the irreparable loſs of ſo great a man, who with unſpeakable goodneſs and affection attended to my education for eighteen years together, guiding me up the ſteep paths of thoſe ſciences, which himſelf poſſeſſed in a ſupreme degree. But I muſt not now indulge my deſire of doing juſtice to his merit. The time will come, and I hope it is not far off, in which I ſhall endeavour to let mankind know, how much they are indebted to him, by publiſhing the *collection of poems* promiſed by him, in the prefatory diſcourſe to his *collection of proſe writings for the uſe of the royal ſchools*, and all his other works;

moſt of them compoſed in the royal univerſity.

But to make an end of this digreſſion, occaſioned by the pleaſing remembrance of ſo good a maſter, the works continually iſſuing from theſe ſo illuſtrious academies, which have chiefly at heart the cultivation and improvement of phyſics, botany, anatomy, phiſiology, and medicine, evidently prove, that there is no road but that of experience and obſervation, by which a man can hope to make any progreſs in theſe ſciences, and attain any degree of true knowledge. And, not to dwell longer on the already mentioned branches of learning, it is certain that the medical hiſtories of uncommon diſeaſes, and ſuch ſingular caſes as there are few opportunities of obſerving, of which, however, we have now many volumes publiſhed by different perſons, (would to God, they had been all written with equal diligence and accuracy, and with leſs fondneſs for the marvellous than the truth) all tend, if we conſider them with an equitable eye, to the ſame laudable end. Among theſe ſingular caſes, we may certainly venture to rank that I am now about to ſpeak of; an event ſo thoroughly ſurpriſing in all its circumſtances, that for my part, I may ſafely affirm, I never heard or read of any thing like it.

It has hitherto been the almoſt general opinion of philoſophers, that the vapours and exhalations of earthly bodies, by whatever cauſes (repeated experiments may perhaps diſcover and determine them) carried into the atmoſphere, aſcend to different heights, on account of the different denſity, and conſequently different ſpecific gravity of the air at different diſtances from the earth; and that, whenever theſe vapours or exhalations acquire a greater ſpecific gravity than that of the air in which they float, they fall back towards the ſurface of the earth. This has hitherto been chiefly attributed either to the ſun's early rays ſtriking directly againſt theſe vapours, and ſo bearing them down to the earth: or to their requiring more time to be heated, and conſequently rarified by the ſun's rays, than the circumambient air, which, as lighter, muſt of courſe let them fall to the earth; a thing we may often obſerve in ſpring or autumn along rivers and other waters, which continue for ſome time covered with a thick fog: or to the quantity of vapours already raiſed into the atmoſphere, as being ſo great that new ones cannot find room enough to diſperſe in it, and therefore meeting with a reſiſtance ſuperior to that with which they are impelled: or to the vapours being of ſuch different qualities, that they cannot mix without producing a kind of fermentative motion ſufficient, as we may obſerve in chemical operations, to precipitate ſome of them: or elſe to the air ſupporting the vapours, being ſwept from under them by horizontal winds, and giving way to a rarer air, leſs qualified to ſupport their bodies moving, as every one knows, towards that quarter in which they find the leaſt reſiſtance: or elſe to the winds blowing in an oblique direction towards the earth, and carrying the vapours with them in the ſame direction: or elſe, in fine, to their being driven one againſt another by oppoſite winds, or againſt hills and mountains, and thereby condenſed ſo as to become heavier than the air itſelf. For, ſome of theſe cauſes, or, perhaps, others, which may be hereafter diſcovered by the exact obſervations of philoſophers, deſtroying the equilibrium between the vapours floating in the air, and the air itſelf; it is evident that theſe vapours muſt fall back to the ſurface of the earth, and, in their fall, form, according to their weight, ſize, and figure; fog, rain, ſnow, or ſome other of theſe appearances, by the philoſophers ſtiled aqueous meteors. Among the cauſes which make the earthly vapours mixed with the air, fall back to the earth, that of the winds driving them againſt the mountains, with which we are in a manner entirely ſurrounded, is, as far as we can hitherto gueſs, the moſt common cauſe in this part of the world. And therefore we know that there falls more rain and ſnow in the mountains, than in the flat country; rain, when there is not cold enough to freeze the vapours before they come near the earth; and ſnow, whenever they mix with any of thoſe particles capable of producing congelation, or the air itſelf is cold enough to have alone that effect. But as it is reaſonable to believe, that the air of mountains is leſs warm than that of plains, hence it follows, that it muſt oftener, and more heavily ſnow on the former, than on the latter. Three years ago, at ſix o'clock in the morning of the twenty-eighth of July, the ſpirit of a Reaumeriau thermometer of mine, was but five degrees above the freezing point at the baths of Valdieri; and about five in the evening, when it had got up to eleven degrees, there fell for the ſpace of half an hour, a frozen rain, which, all to its being a little more denſe, had the appearance of ſnow; whereas in another thermometer of mine at Turin, and the fellow to the firſt, the ſpirit roſe at the ſame time to twenty degrees, as appears from the notes taken by the perſon whom I had ordered to obſerve it in my abſence. The ſame thing had already happened about ſix in the evening of the twenty-ſecond, when the ſpirit of the thermometer at the bath, was at twelve; and that at Turin at twenty-ſeven degrees. On the ninth of June, of the year 1749, there fell in the valley of Demonte, and likewiſe in the town itſelf, ſo great a quantity of ſnow, that it covered the earth to the height of ſix of our inches. To this it is owing, that in the mountains the ſnow ſometimes falls in ſuch vaſt quantities, and accumulates to ſuch a degree, that when ariſen to a certain height, it falls into the lower grounds in immenſe heaps, which in our country are called *Valanche*, (a word derived from the French word *Lavange)* and which, perhaps, by the Tuſcans are called *Labine* or *Lavine*. This ſtate of the ſnow is not unlike what the illuſtrious Tozzetti relates of heaps of ſtones, in his account of ſome journies made by him, through different parts of Tuſcany. Deſcribing, in his firſt tome, the valley of Buti, he thus ſpeaks of the declivity called *Il Saſſeto.* "In order to underſtand the meaning of this word *Saſſeto*, it is proper to obſerve, that the ſides of the Piſan mountains are generally ſo very ſharp and ſteep, that the rain waters in their deſcent along them, acquire a ſurpriſing degree of velocity and ſtrength. Beſides, as thoſe mountains are very high, and near the ſea, the clouds eaſily ſtop on their ſummit, and almoſt inſtantaneouſly diſſolve into cataracts, which tumbling headlong down the precipice, and every moment acquiring new bulk and ſtrength, carry along with them, all the looſe and ſingle ſtones they meet with; and then by the daſhing of theſe ſtones, and their own ſhock, root up all the fir and cheſnut-trees they meet with, and roll through a great extent of country, a horrible quantity of large ſtones, till the declivity decreaſing, and conſequently their own ſtrength, they are obliged to leave them behind. Theſe *Labine*, or vaſt heaps, which conſiſt of nothing but ſtones (the earth being carried off to the bottom along with the water) are called Saſſeti, and are very common in the Piſan mountains, eſpecially in the valley of Calci, and are viſible at a great diſtance, for they look like ſo many ſquares, or naked ſlips of ground in the midſt of thick woods." The learned Scheuchzer, in order to diſplay in his fourth journey over the Swiſs alps, the great danger, to which perſons travelling by mount Gottardo are expoſed by theſe Valancas, begins by explaining the word itſelf, and ſays, " *Labinæ* vel *Labenæ*, vocabulum ad ultimam latinitatem relegandum notat nivoſas ingentes moles conglomeratas, quæ per declivia Alpium latera *labi* (inde autem nomen) ſolent. Mihi cum Simlero de Alpibus, p. 113. videtur latina æque ac germanica denominatio arceſſenda a Rhætis, qui italico idcomate labinas vocant *Lavine*, vernaculo autem *Lavigne*." And theſe he reduces to two principal kinds, one of which, he ſays, is called by the Italians *Lavina di freddo*, the other, *Lavina di caldo*. "Labinarum genera ſunt potiſſimuum duo, unum, ſi novæ, & molles duntaxat nives conglobantur, et labuntur. Simler p. 113. b. vocant has *Windlowenen*, tum a cauſâ, vento nivem recens delapſam commovente, tum ob effectum, quoniam celeriter ruunt, et lapſu ſuo ventum procelloſum excitant, qui etiam eminus quæque proſternit, abietes craſſiſimas frangit, homines et jumenta ſuffocat, ædes & ſtabula ſubvertit; item *Staublowinen*, Staubloweln (Rahm Geſpr. p. 132) a vento et pulvere nivoſo, quo conſtat, et quævis in valle obvia obtegit ac involvit; alji κατ' ἐξοχὴν *Schneelauwinen*, quod ex mera nive conſtant: Itali *Lavine di freddo*, Engadienſes *Lavigne da fraid*, quaſi dicas *Labinas ex frigore*, *Labinas Hyemales*, hybernas; quoniam hyeme potiſſimum, et frigidiſſima aeris temperaturâ (qua nivei flocci recens lapſi raram poroſam con ſtituunt maſſam a vento quovis facile diſſipabilem, nec dum propius coactam) oriri ſolent. Sunt hæ admodum periculoſæ, eo ſcilicet ſenſu, quatenus fuga non tam facile evitari poſſunt, et cito ſæpe viatores obruunt, nec via recta decurrunt, ſed a vento flante nunc hac, nunc illac pelluntur; alio tamen reſpectu minus lethales, quam quæ mox deſcribendæ veniunt, quoniam minus ſunt compactæ, ut qui iis involvuntur facilius ſe extricare queant, nec vitam ſtatim ſuffocati amittant." This firſt kind deſcribed by Scheuchzer is not, I think, called *Valanca* by our Alpineers, but *Tormenta*, a word taken from the French *Tourmente*, ſignifying properly ſnow whirled about with great impetuoſity by the wind, which tears the thickeſt and ſtouteſt trees from their roots, beats down animals to the ground, and ſuffocates them; as is too often the caſe with thoſe who are indiſcreet enough to attempt the paſſage of the *Colle di Tenda*, or Mount Cenis, at a time judged improper by thoſe who continually reſide in ſuch ſituations, and can therefore foretell, by certain ſigns, the ſudden riſe of theſe terrible whirlwinds. Of the ſecond kind he writes thus: " Alterum pergit *Siml.* quod inveteratam nivem quoque trahit, et multum terræ ſecum abripit. Nuncupantur hæ *Schloſs* et *Schlaglauwinen*, quoniam non tam ſecundante vento, quam ponderoſâ mole cuncta, quæ in via occurrunt, proſternunt, diruunt, nec ſolam nivem ſecum vehunt, ſed et arbores radicitus extirpatas, rupes et ſaxa prægrandia; et viatores, quos corripiunt, vel ſtatim ſuffocant, vel tam arcte claudunt, ut capite ſolo liberi, reliquo autem corpore integro involuti ſeſe exolvere nequeunt, ſed perire neceſſum habeant. Hoc ſane ſenſu prioribus ſunt magis exitiales, minus tamen periculoſæ, quatenus non tam cito defluunt, nec etiam tam latum occupant ſpatium, quin mature conſpectæ evitari poſſint. Itali hoc labinarum genus vocant *Lavina di caldo*, Engadienſes *Lavigna da* *chiod*, quoniam verno potiſſimum tempore, quo calor redit et nives conſtipat, excitari ſolent. Solent hæ delapſu ſuo ingentes concitare fragores, tonitrui ſimiles, ob concuſſam violenter terram, et repercuſſum ad latera montium aerem tremulum." Here with us, this ſecond kind is alone called *Valanca*; which word I muſt beg leave to uſe in relating an event that happened a few years ago in our neighbourhood.

It has been obſerved, that the *Valancas* of ſnow are formed two ſeveral ways. The firſt is, when the ſnow falls for ſome length of time, and in large quantities, on a plain, forming with the horizon, an angle of 45° or thereabouts, and heated to ſuch a degree, as little by little to melt that part of the ſnow which immediately covers it. For the whole body, it is plain, reſting on a ſurface too ſmooth and ſlippery to retain it, cannot but ſlide away, and tend downwards; ſo that, if by ſuch motion, it reaches a precipice, it muſt fall, and in conſequence of the impetus acquired by ſuch fall, continue to move and run even over any little horizontal plain it may meet with, till it meets with ſome reſiſtance capable of effectually ſtopping it. It is in this manner, and for the very ſame reaſon, that often pretty large tracts of land, with the plants, trees, and ſometimes even the houſes upon them, get looſe from the hills; when the earth in which they are fixed, is of ſuch a conſiſtence as to let the water through it in ſufficient quantity to deſtroy its adheſion to the part immediately under it, and ſo move towards that ſide where the declivity is greateſt; ſliding, if the plane, upon which they move, makes with the horizon an angle leſs than 45°, and rolling and tumbling if it happens to be much greater. The other way, in which valancas are formed, is when the ſnow accumulates on a plain, making with the horizon an angle much greater than forty-five degrees, till the perpendicular, from its center of gravity, falling without the baſe, or its weight growing too great for the force with which it adheres to the ground, the whole, or a great part of it, ſuddenly gets looſe, and ruſhing down violently, overturns every thing that oppoſes its headlong courſe. Now, it is but too often we have in our mountains, fatal inſtances of both theſe kinds of valancas. In the months of February and March of the year 1755, we had in Turin, a great fall of rain, the ſky having been almoſt conſtantly overcaſt from the ninth of February, till the twenty-fourth of March. During this interval, in which, namely, on the thirteenth of February, the mercury fell to twenty-ſix inches and eight lines, and never roſe to above twenty-ſeven inches and ſeven lines; it rained almoſt every day, but ſnowed only on the morning of the twenty-firſt of February, when the liquor of Reaumur's thermometer, ſtood but one degree above the freezing point. Now, as for the reaſons already aſſigned, it often ſnows in the mountains, when it only rains in the plain; it cannot appear ſurpriſing, that during this interval, there fell vaſt quantities of ſnow in the mountains that ſurround us, and in courſe, ſeveral valancas were formed. In fact, there happened ſo many in different places on the ſide of Aoſta, Lanzo, Suſa, Savoy, and the county of Nice, that by the end of March, no leſs than two hundred perſons had the misfortune of loſing their lives by them. Of theſe overwhelmed by theſe valancas, three perſons, however, *Mary Anne Roccia Bruno*, *Anne Roccia*, and *Margaret Roccia*, had reaſon to think themſelves, in other reſpects, extremely happy, having been dug alive on the twenty-fifth of April, out of a ſtable, under the ruins of which, they had been buried, the nineteenth of March, about nine in the morning, by a valanca of ſnow, forty two feet higher than the roof, to the incredible ſurpriſe of all thoſe who ſaw them, and afterwards heard them relate how they lived all this while, with death,

as

as we may ſay, continually ſtaring them in the face.

The road from Demonte to the higher valley of Stura, runs amidſt many mountains, which joining one another, and ſometimes riſing to a very great height, form a part of thoſe alps, by hiſtorians and geographers, called maritime alps, ſeparating the valley of Stura and Piedmont, from Dauphiny, and the county of Nice. Towards the middle of the road leading to the top of theſe mountains, and on the left of the river Stura, we meet with a village called Bergemolo, paſſing through which village, and ſtill keeping the road through the ſaid valley, we, at about a mile diſtance, arrive by the way laid down (Plate 1. num. 20.) at a little hamlet called Bergemoletto, containing about one hundred and fifty ſouls. This hamlet is laid down in the firſt plate, which exhibits, though not preciſely as to diſtance, the mountains and the houſes, part ſtanding and part in ruins, of which we are ſpeaking. From this place there run two narrow lanes, both to the right and left, one leſs ſteep and fatiguing than the other, and in ſome meaſure along two vallies, to the mountains number 1. 1. 2. 2. 3. 13. From number 13, which exhibits the ſlope of the mountain towards the north, to the top of that marked 3; there is no road or path-way whatſoever, and nothing is to be ſeen on it, but one old, knotty, and almoſt branchleſs beech-tree. The ſummit of this mountain, as far as number 13, makes with the horizon, an angle much greater than 45°, and ſo much greater in ſome places, as to be in a manner perpendicular, ſo that it is a very difficult matter to climb it, even by a winding path: It is well known that there is no aſcending ſo ſteep a plane, whoſe horizontal baſe is leſs than half its height, but by the aſſiſtance of ſteps, or at leaſt a ſerpentine road. The bye lanes on the north ſide terminate at number 7, from whence, with ſome difficulty, one reaches by a ſide road, number 13. In the environs of number 10, and ſomewhat higher, as well as on the other ſide, going towards number 8; and near the ſummits are ſeveral copſes of beech, birch, and myrtle, whoſe berries yield food to the pheaſants, that often live ſecurely in theſe mountains; to theſe copſes too, the Alpineers in ſummer, lead their goats and other cattle to feed in the ſummer months. From number 12 to number 11, the road is in a manner level; from number 11 to number 10, the ſteepeſt aſcent of the whole valley, is about a quarter of a mile; and from number 10 to number 9, it is almoſt three quarters of a mile: I call it the ſteepeſt aſcent, becauſe, going by the uſual path of the Alpineers, from number 10 to number 9, they count about a mile and a half; and from number 11 to number 10, about a mile. On the other ſide, paſſing by the valley marked 4 and 8, and going to the ſummits marked 1, 2. the way is ſhorter, and the aſcent much leſs diſagreeable, for by it one may reach the higheſt ſummit of both. At a little diſtance from Bergemoletto, and on both ſides of it to the eaſt and ſouth, we meet with a variety of medicinal and odoriferous plants, ſuch as mountain wormwood, commonly called *Genepi*, gentian, imperatoria, valerian, and veronica; and on the declivity towards the weſt, there are ſome meadows which yield tolerable crops of hay, and ſome corn-fields bearing rye and Indian wheat, the bread of which, with milk and cheſnuts, are all the ſupport of the inhabitants. Theſe, however, for the greateſt part, though deprived of the numerous conveniences and comforts of life, enjoyed in great towns, and even in the villages of the flat country, live perfectly ſatisfied with their lot, are ſtrong, hardy, and in general very long lived: as is often the caſe in mountains, in which we meet with very old men, ſtraight and robuſt, owing to the wholeſomeneſs of the air and water they enjoy, and the plainneſs of their diet. About ten years ago, there died in Bergemoletto, one Anthony

Bertolotti, at the age of one hundred and twelve years, and ſometime before, another of one hundred and ten. Now it was from the ſummit of the aforeſaid mountains marked 1. 1. 2. 2. 3. 13, that fell the valancas of ſnow, which did ſo much miſchief, and almoſt entirely deſtroyed the hamlet of Bergemoletto.

According to the obſervations of Kepler, des Cartes, Bartolini, who firſt made them in Flanders, and afterwards in the year 1660, in Denmark; likewiſe thoſe of Maſſchenbrok, Dortous, Mairan, and others, the ſmall particles of which ſnow is compoſed, are almoſt always of a hexagonal form. Des Cartes, indeed, had ſeen ſome that were octangalar, and Bartolini, ſome that were pentagonal, and others, ſome of various other forms, owing to the union of ſeveral ſmall flakes, in conſequence of which, it ſometimes reſembles wool, and ſometimes down, feathers, ſtars, wheels, or roſes. But we may eaſily conceive, how, by means of its hexagonal figure alone, the particles of ſnow can take ſuch hold of each other, as to acquire, when many of them are compreſſed together, a roundiſh form. Of this we have an inſtance, in the ſnow-balls which children make in winter, by preſſing the ſnow equally on all ſides with their hands, as might be done with wax, mud, and ſuch other ſubſtances. But this aptneſs of ſnow to acquire a roundiſh form, is moſt conſpicuous in the balls firſt made by ſuch equal compreſſion and then rolled along the ſnow; for they ſo eaſily lick it up, and ſo firmly retain it, as to become much larger, and ſtill retain their roundiſh form; eſpecially if the ſnow, along which they are thrown, has ſome declivity, and is ſo newly fallen, as not to be yet hardened by the froſt. Now, by applying what we thus ſee daily happen in regard to ſnow-balls to the caſe in hand, we may eaſily conceive how a heap of ſnow, may in its fall, encreaſe to ſuch a degree, as to form a valanca capable of overwhelming a vaſt number of houſes. The bad weather which prevailed in ſo many other places, prevailed likewiſe in the *Foreſta* of Bergemoletto. By this word *Foreſta*, the Alpineers underſtand the villages diſperſed over the vallies covered with ſmall trees and buſhes, and ſurrounded with high mountains; for it began to ſnow early in March, and the fall encreaſed ſo much on the 16, 17, 18, and 19, that many of the inhabitants began to apprehend, and not without reaſon, that the weight of that which was already fallen, and ſtill continued to fall, might cruſh their houſes, built with ſtones peculiar to the country, cemented by nothing but mud, and a very ſmall portion of lime, and covered with thatch laid on a roof of ſhingles and large thin ſtones, ſupported by thick beams. They therefore, got upon their roofs to lighten them of the ſnow. At a little diſtance from the church marked 7, ſtood the houſe of Joſeph Roccia, a man of about fifty, huſband of Mary Anne, born in Demonte, of the family of Bruno; who, with his ſon James, a lad of fifteen, had, like his neighbours, got upon the roof of his houſe on the 19th in the morning, in order to leſſen the weight on it, and thereby prevent its deſtruction. In the mean time, the clergyman who lived in the neighbourhood, and was about leaving home, in order to repair to the church, and gather the people together to hear maſs; perceiving a noiſe towards the top of the mountains, and turning his trembling eyes towards the quarter from whence he thought it came, diſcovered two *Valancas* driving headlong towards the village. Wherefore, raiſing his voice, he gave Joſeph notice, inſtantly to come down from the roof, to avoid the impending danger; and then immediately retreated himſelf into his own houſe.

Theſe two valancas ſet off at once, in a manner, from number 1, 1. 2, 2. and as they ran along a plane forming with the horizon an angle leſs than 45°, it is pretty evident that they are to be deemed of the firſt kind. They met and united at number 8, ſo as to form but one valanca;

which continued to deſcend towards the valley, where, on account of the increaſe of its bulk, the dimunition of its velocity, and the inſenſible declivity of the plane, it ſtopped at number 4; and arreſted by the neighbouring mountain, though it covered a large tract of land, did no damage either to the houſes or the inhabitants. Joſeph Roccia, who had formerly obſerved that the fall of one valanca, was often attended with that of others, immediately came off the roof at the prieſt's notice, and with his ſon fled as hard as he could towards the church, without well knowing, however, which way he went; as is uſually the caſe with the Alpineers, when they gueſs by the report in the air, that ſome valanca is falling, or ſeeing it fall with their own eyes. The poor man had ſcarce advanced forty ſteps, when hearing his ſon fall juſt at his heels, he turned about to aſſiſt him, and taking him up, ſaw the ſpot on which his houſe, his ſtable, and thoſe of ſome of his neighbours ſtood, converted into a huge heap of ſnow, without the leaſt ſign of either walls or roofs. Such was his agony at this ſight, and at the thoughts of having loſt in an inſtant, his wife, his ſiſter, his family, and all the little he had ſaved, with many years increaſing labour and œconomy, that hale and hearty, as he was, he immediately, as if heaven and earth were come together, loſt his ſenſes, ſwooned away, and tumbled upon the ſnow. His ſon now helped him, and he came to himſelf little by little; till at laſt, by leaning upon him, he found himſelf in a condition to get on the valanca, and in order to re-eſtabliſh his health there, ſet out for the houſe of his friend Spirito Roccia, about one hundred feet diſtant from the ſpot, where he fell. Mary Anne, his wife, who was ſtanding with her ſiſter-in-law Anne, her daughter Margaret, and her ſon Anthony, a little boy two years old, at the door of the ſtable, number 15, looking at the people throwing the ſnow from off the houſes, and waiting for the ringing of the bell that was to call them to prayers, was about taking a turn to the houſe, in order to light a fire, and air a ſhirt for her huſband, who could not but want that refreſhment after his hard labour. But before ſhe could ſet out, ſhe heard the prieſt cry out to them to come down quickly; and raiſing her trembling eyes, ſaw the foreſaid valancas ſet off, and roll down the ſide of the mountain from number 1, 1. 2, 2. and at the ſame inſtant heard a horrible report from another quarter, which made her retreat back quickly with her family, and ſhut the door of the ſtable. Happy it was for her, that ſhe had time to do ſo; this noiſe being occaſioned by another immenſe valanca, the ſole cauſe of all the miſery and diſtreſs ſhe had to ſuffer for ſo long a time. And it was this very valanca, over which Joſeph her huſband was obliged to paſs after his fit, in his way to the houſe of Spirito Roccia.

Some minutes after the fall of the valanca number 1, 1. 2, 2. another huge one broke off from number 3, 13. driing along the valley number 9, 10, 16, 18, 15, 19, 6, 11, 12. it beat down the houſes number 16, 18, 19, 15, 6. which it met in its courſe. This valanca encreaſed greatly, by the ſnow over which it paſſed, in its headlong courſe, and ſoon reached number 4, 4. with ſo much impetuoſity, that ſtriking againſt the firſt fallen valanca, it carried away great part of it; then returning back with this reinforcement, it demoliſhed the houſes of number 5, ſtopping in the valley upon thoſe of number 6, 15, 18, which it had already overwhelmed in its firſt progreſs: So that, from number 12, 5, 6. to number 18. the ſnow lay about forty two of our feet in height, two hundred and ſeventy in length, and about ſixty in breadth. Here it is to be noted, that ſeven inches and ſeven lines of our foot of Eliprandus, are equal to the twelve inches of the Paris foot; ſo that the height of the ſnow, Paris meaſure, amounted to more than ſeventy-ſeven feet; the length of it to more than four hundred and twenty-ſeven, and the breadth above ninety-four. Yet this headlong valanca did not all of it reach number 4, ſome of it having at number 10, ſtruck againſt the ſkirt of a mountain, and thereby loſt that part, which, conſidering the direction of its courſe, would have infallibly demoliſhed the houſes of number 11, that remained untouched. Some people affirm, that the concuſſion of the air occaſioned by this valanca, was ſo great, that it was heard at Bergemolo, and even burſt open ſome doors and windows at that place. This I know, that the damage occaſioned by this valanca, was ſo great, that nothing eſcaped it in Bergemoletto, but the few houſes at number 17, the church number 7, and the houſe of John Arnaud number 14. The firſt, by being defended by a riſing ground, which ſeparates it from number 5; the church and the houſe of John Arnaud, by lying out of the direction in which it moved.

The inhabitants of Bergemoletto, whom it pleaſed God to preſerve from this diſaſter, remained.

" ——— As thoſe who from the ſhore ;
" Joyful and ſecure, ſtand looking on
" Some wretched ſhip, foundering, in the
" waves,
" And only feel in their breaſts that in-
" nate concern,
" Ariſing from a compaſſion for the miſ-
" fortunes of others,
" And the fear of what may happen to
" ourſelves."

Being therefore gathered together, in order to ſum up their misfortunes, they firſt counted thirty houſes overwhelmed ; and then every one calling over thoſe he knew, twenty-two ſouls were miſſing, of which number, was D. Giulio Cæſare Emanuel, their pariſh-prieſt, who had lived among them forty years. The news of this terrible diſaſter, ſoon ſpread itſelf over the neighbourhood, ſtriking all thoſe who heard it, with grief and compaſſion. All the friends and relations of the ſufferers, and many others, flocked of their own accord, from Bergemolo and Demonte; and many were diſpatched by the magiſtrates of theſe places, to try if they could give any relief to ſo many poor creatures, who, perhaps, were already ſuffocated by the vaſt heap of ſnow that lay upon them; ſo that by the day following, the number aſſembled on this melancholy occaſion, amounted to three hundred. Joſeph Roccia, notwithſtanding his great love for his wife and family, and his deſire to recover part of what he had loſt, was in no condition to aſſiſt them for five days, owing to the great fright and grief, occaſioned by ſo ſhocking an event, and the ſwoon which overtook him at the firſt ſight of it. In the mean time, the reſt were trying, if, by driving iron-rods through the hardened ſnow, they could diſcover any roofs; but they tried in vain. The great ſolidity and compactneſs of the valanca, the vaſt extent of it in length, breadth and heighth, together with the ſnow, that ſtill continued to fall in great quantities, eluded all their efforts; ſo that after ſome days labour, they thought proper to deſiſt from their trials, finding that it was throwing away their time and trouble to no purpoſe. The huſband of poor Mary Anne, no ſooner recovered his ſtrength, than in company with his ſon, and Anthony and Joſeph Bruno, his brothers-in-law, who had come to his aſſiſtance from Demonte, where they lived, did all that lay in his power to diſcover the ſpot, under which his houſe, and the ſtable belonging to it, were ſituated. But neither himſelf, nor his relations, could make any diſcovery capable of affording them the ſmalleſt ray of comfort; though they worked hard for many days, now in one place, and now in another, unable to give up the thoughts of knowing for certain, whether any of their family was ſtill alive, or if they had under

der the ſnow and the ruins of the ſtable, found, at once, both death and a grave. But it was all labour loſt, ſo that, at length, he thought proper to return to the houſe of Spirito Roccia, and there wait, till, the weather growing milder, the melting of the ſnow ſhould give him an opportunity of paying the laſt duty to his family, and recovering what little of his ſubſtance might have eſcaped this terrible calamity.

Towards the end of March, the weather, through the lengthening of the days, and the ſetting in of the warm winds, which continued to blow till about the twentieth of April, began to grow mild and warm; and, of courſe, the great valanca to fall away partly by exhalation, partly by the action of the winds, which ſweep away the more minute particles they meet with on the ſurface of bodies, and partly by the melting of the ſnow and ice that compoſed it; ſo that little by little, the valley began to aſſume its priſtine form. This change was very ſenſible, eſpecially by the eighteenth of April, ſo that the time ſeemed to be at hand for the ſurviving inhabitants of Bergemoletto to reſume their interrupted labours, with ſome certainty of recovering a good part of what they had had loſt on the unfortunately memorable morning of the nineteenth of March. Accordingly, they diſperſed themſelves over the valanca, ſome trying in one place, and ſome in another, now with long ſpades, and another time with thick rods of iron, and other inſtruments proper to break the indurated ſnow. One of the firſt houſes they diſcovered by this means, was that of Louiſa Roccia, number 16, in which they found her dead body, and that of one of her ſons. Next day, in the houſe called the confreria, number 19, that had two rooms on the ground floor, and one above them, they found the body of D. Giulio Cæſare Emanuel, with his beads in his hand, and two large beams behind him. Joſeph Roccia, animated by theſe diſcoveries, ſet himſelf with new ſpirits about diſcovering the ſituation of his houſe, and the ſtable belonging to it; and with ſpades and iron crows, made ſeveral wide and deep holes in the ſnow, throwing great quantities of earth into them; earth mixed with water, being very powerful in deſtroying the ſtrong coheſion of ſnow and ice. On the twenty-fourth, having made himſelf an opening two feet deep into the valanca, he began to find the ſnow ſofter and leſs difficult to penetrate; wherefore, driving down a long ſtick, he had the good fortune of touching the ground with it. We may obſerve in the formation of ice, that the firſt parts to congeal are thoſe on the ſurface, from whence the congelation extends itſelf, little by little, to the internal parts, till all have loſt their motion, and become one ſolid and compact body: unleſs, indeed, when it happens, that the efficient cauſe of the ice, is not ſtrong enough to reach a great way, for then the internal parts neareſt the earth, remain ſoft and fluid, while the external ones become hard and ſolid. It is the ſame in proportion with ſnow, the upper ſurface of which, is ſometimes hard and ſolid, while that touching the ground, continues leſs compact and reſiſting. But beſides this reaſon for the great ſoftneſs of the lower parts of the valanca, there is another more evident, namely, the heat of the weather, which by inſenſibly diſſolving the upper ſnow, rendered it more apt to penetrate that which lay under it, and ſo fit it more eaſily to receive the poles thruſt into it.

It was no ſmall addition to Joſeph's ſtrength and ſpirit, to be thus able to reach the bottom; ſo that he would have joyfully continued his labour, and might perhaps, on that very day, had it not been too far advanced, recovered ſome part of what he was looking for, and found that which, aſſuredly, he by no means expected to meet with. When, therefore, he deſiſted for that time, it was with much greater reluctance than he had done any of the preceding days. The anxiety of Joſeph,

ſeph, during the following night, may well be compared to that of the weather-beaten mariner, who finding himſelf, after a long voyage, at the mouth of his deſired port, is yet, by the coming on of night, obliged to remain on the inconſtant waves till next morning. Thoſe who have experienced what it is to long for a thing at hand, may imagine how often he thought he could diſcern the rays of the ſun peeping over the mountains, in order to reſume his labour. Wherefore, at the firſt gleam of light, he, with his ſon, haſtened back to the ſpot, where the preceding day he had reached the ground with the ſtick, and began to work upon it again; but he had not worked long, when lo, to his great ſurpriſe, who ſhould he ſee coming to his aſſiſtance, but his two brothers-in-law, Joſeph and Anthony Bruno.

Anthony, it ſeems, the night between the preceding Thurſday and Friday, being then in Demonte, dreamed that there appeared to him, with a pale and troubled countenance, his ſiſter Mary Anne Roccia, who, with an earneſtneſs intermixed with grief and hope, called upon him for aſſiſtance in the following words: “ Anthony, “ though you all look upon me as dead in “ the ſtable where the valanca of ſnow “ overwhelmed me on the nineteenth of “ March, God has kept me alive. Haſten “ therefore to my aſſiſtance, and to relieve “ me from my preſent wretched condi“ tion; in you, my brother, have I placed “ all my hopes, dont abandon me; help, “ help, I beſeech you.” Anthony's imagination, was ſo affected by the thoughts of thus ſeeing his ſiſter, and hearing her utter theſe piteous words, that he immediately ſtarted up;

“ Like a man who reaſſures himſelf in
“ the midſt of doubt,
“ And changes his fear into comfort,
“ Becauſe he has diſcovered the truth.”

And calling out to his brother Joſeph, he acquainted him with what he had ſeen and heard. They both, therefore, as ſoon as it was day, ſet out for Bergemoletto, where they arrived a little before eight, tired and out of breath, for they ſeemed to have their ſiſter continually before their eyes, preſſing them for help and aſſiſtance. Having therefore taken a little reſt and refreſhment, they ſet out again for the place, where Joſeph Roccia, and many others, were hard at work in looking for the wrecks of their houſes. Joſeph had left the ſpot, where, the day before he thought he had reached the ground, and was trying to reach it in other places. His brothers-in-law immediately fell to work with him, and making many new holes in the ſnow, the interior parts of which were not ſo very hard, with the ſame iron rods, with earth, and with long poles, they at laſt, about ten, diſcovered the ſo long ſought for houſe number 18, but found no dead bodies in it. Knowing that the ſtable did not lie one hundred feet from the houſe, they immediately directed their ſearch towards it, and proceeding in the ſame manner, about noon, they got a long pole through a hole, from whence iſſued a hoarſe and languid voice, which ſeemed to ſay: help, my dear huſband, help, my dear brother, help. The huſband and brother thunderſtruck, and at the ſame time encouraged by theſe words, fell to their work with redoubled ardour, in order to clear away the ſnow, and open a ſufficient way for themſelves, to the place from whence the voice came, and which grew more and more diſtinct as the work advanced. It was not long, therefore, before they had made a pretty large opening, through which (none minding what danger he expoſed himſelf to) Anthony deſcended, as into a dark pit, aſking who it was, that could be alive in ſuch a place. Mary Anne knew him by his voice, and anſwered with a trembling and broken accent, intermixed with tears of joy. " 'Tis I, my dear brother, who am ſtill alive in company with my daughter and my ſiſter-in-law, who are at my elbow.

God, in whom I have always truſted, ſtill hoping that he would inſpire you with the thoughts of coming to our aſſiſtance, has been graciouſly pleaſed to keep us alive." God who had preſerved them to this moment, and was willing they ſhould live, inſpired Anthony with ſuch ſtrength and ſpirits, that, notwithſtanding the ſurprize and tenderneſs, with which ſo joyful and at the ſame time ſo ſad a ſight muſt have affected him, had preſence of mind enough to acquaint his fellow labourers, all anxiouſly waiting for the report of his ſucceſs, that Mary Anne, Margaret, and Anne Roccia were ſtill alive. Whereupon Joſeph Roccia, and Joſeph Bruno, enlarging the paſſage as well as they could, immediately followed him into the ruins; whilſt the other Alpineers, ſcattered over the valanca in queſt of their loſt ſubſtance, and the dead bodies of their relations, on the ſon's calling out to them, flocked round the mouth of the pit, to behold ſo extraordinary a ſight; not a little heightened by that of two live goats ſcampering out of the opening. In the mean time, thoſe who had deſcended into the hole, were contriving how to take out of it the poor and more than half dead priſoners, and convey them to ſome place, where they might recover themſelves. The firſt thing they did was to raiſe them up, and take them out of the manger in which they had been ſo long ſtowed. They then placed them one by one on their ſhoulders, and lifted them up to thoſe who ſtood round the mouth of the pit, who with very great difficulty took hold of them by the arms, and drew them out of their dark habitation. Mary Anne, on being expoſed to the open air, and ſeeing the light, was attacked by a very acute pain in the eyes, which greatly weakened her ſight, and was attended with ſo violent a fainting fit, that ſhe had almoſt like to have loſt, in the firſt moments of her deliverance, that life, which ſhe had ſo long and with ſuch difficulty preſerved. But this was a conſequence that might be eaſily foreſeen. She had been thirty ſeven days, ſecluded, in a manner entirely, from the open air; nor had the leaſt ray of light, in all that time, penetrated her pupils. Such is the action of the ſolar rays on the eye, that the pupil always adaps itſelf to the quantity of them; opening when the quantity is ſmall, and cloſing when it is great. It is for this reaſon, that going from a very lightſome place, eſpecially if we have been in it for ſometime, into one much leſs ſo, or ſomewhat dark, we immediately loſe the capacity of diſtinguiſhing objects; the pupil being too contracted for the rays of light to enter it in ſufficient quantity, ſo that we can diſcern nothing, until we have been in ſuch place long enough for the pupil to return to its primitive configuration. As to the rays of light having ſuch a power over our eye, as merely by touching it muſt excite in us the ſenſation of pain, it is a thing confirmed by numberleſs obſervations. Some perſons cannot bear walking abroad after a great fall of ſnow, on account of the inſupportable quantity of rays which it throws upon their eyes. Others, who are accuſtomed to ſleep without any light in their chambers, are awakened by the leaſt quantity of light breaking in at the windows. Others, again, who are troubled with inflamations of the eyes, experience the ſharpeſt pains at the admiſſion of the ſmalleſt ray of light. I ſhall ſay nothing of the action of the open air on our bodies, which is, certainly, very great; ſome phiſiologiſts having proved by the exacteſt obſervations, that it is capable of doing the greateſt miſchief to thoſe who have not been expoſed to it for ſome time. Of this I have myſelf had an inſtance in my firſt maſter the late doctor Giovanni Fantoni, a man of great parts and learning, highly eſteemed by foreigners, and father of the plain and only good method of practice, who, after teaching anatomy in our univerſity, of which he was the chief ornament, with the theory and practice of medicine, was promoted to the dignity of reformer and preſident of the faculty. This gentleman on his firſt going abroad, after many months confinement by violent contractions of the ſtomach, and palpitations of the heart, ſuffered ſo much from the mere impreſſion of the free air, that he was obliged by the moſt acute and pungent pains in the head to ſhut himſelf up again in his cloſet for many months, at the end of which, trying to renew, as he expreſſed himſelf, his acquaintance with the open air, he found it was become his enemy to ſuch a degree, as to leave him no hopes of being any more able to converſe freely with it. So that after many trials, and at different ſeaſons, he at laſt found himſelf obliged to ſpend the laſt eight years of his life, within the narrow bounds of a ſmall bed chamber. If, therefore, the open air can become ſo offenſive to thoſe, who, though living in places that communicate with it, have not been for ſome time expoſed to its immediate influence, where is the wonder that it ſhould have ſuch influence on a perſon ſuddenly brought into it, and who, like Mary Anne had been ſo long buried forty-two feet deep under the ſolid ſnow, as to make her faint away? Her ſon found means to bring her to herſelf with a little melted-ſnow, there being nothing elſe at hand fit for the purpoſe, and the accident that happened her was improved into a rule for treating the companions of her misfortune. They, therefore, covered all their faces, and wrapped them up ſo well, as to leave them but juſt room to breathe, and in this condition took them to number 14, the houſe of John Arnaud, where Mary Anne was entirely recovered from her fit, by a little generous wine. They then directly placed them in ſome little beds put up in the ſtable, which was moderately warm, and almoſt entirely without light, and prepared for them a meſs of rye meal gruel, mixed with a little butter; but they could ſwallow but very little of it, finding their ſtomachs immediately overloaded, and their reſpiration, in a manner, taken away by it. The poor creatures had, during the whole time of their confinement, taken but one kind of food, and had, if I may be allowed the expreſſion, given their ſtomachs ſo long a holiday, that being now called upon to reſume their priſtine functions and labours, it was impoſſible for them not to feel the effects of it. It is the general opinion of the ableſt phyſicians, that none but the ſlighteſt food, and this too in ſmall quantities, is fit for thoſe perſons who have been obliged by ſickneſs to confine themſelves for a long time to a ſmall quantity of nouriſhment; and the reaſon of it is evident. In ſuch perſons the digeſtive juices cannot be very active, nor the fibres of the ſtomach ſufficiently ſtrained, ſo that no ſolid food, nor even the lighteſt in large quantities, can be ſufficiently penetrated by theſe juices, nor ſufficiently triturated by the languid ventricle to yield that mild and ſweet liquor, which flowing into the veins, is capable of repairing all the loſſes of the blood. Hence it is, that when ſuch perſons permit themſelves to be hurried on by the cravings of too briſk an appetite, or impoſe upon themſelves ſo far as to think they ought to eat a great deal to recover, and repair their loſt ſtrength, in ſpite of all their phyſicians can ſay to them, they ſoon ſmart for their folly and intemperance, by pains in the ſtomach, weakneſs of the body, and not unfrequently relapſes, much more dangerous than the original diſorder. The great love and compaſſion, therefore, of the huſband, brothers, and all thoſe about the three poor creatures newly born, as one may ſay, to the ſun, and riſen from the dead, made them take on this occaſion, all the precautions the weakneſs of their condition required. The want of food, the moiſture and the cold, they had ſo long ſuffered, added to their being confined the whole time to one poſture, had contracted their legs ſo much, and ſo greatly weakened their bodies, that they could by no means ſtand on their feet, and even looked more like dead carcaſes than living bodies. Their cloaths were almoſt entirely rotted by the ſnow water that continually diſtilled upon them; and Mary Anne's ſhift in particular was little better than lint, and ſo impregnated with filth and naſtineſs, that four waſhings in boiling lie, were hardly ſufficient to make it clean again. It was with great difficulty they could extend their legs, eſpecially the two oldeſt; and the legs and thighs of Mary Anne were beſides ſwelled greatly. Their friends, therefore, ſent the next day for doctor Nicolai of Demonte, to whom I am very much indebted for the full account he gave me of the health of theſe poor women to the preſent time; and in the interim, kept them in the ſtable, which they did not warm a ſecond time, but fed them now and then with the ſame meſs, and with a little goats milk, to which were added a few ſpoonfuls of pure wine.

The phyſician, on his arrival the 27th at Arnauld's houſe, found them in the following condition. Mary Anne had a weak and uneven pulſe, complained of a dead pain in the forehead, of frequent ſwimmings of the head, and dimneſs of ſight, and of ſome beginning of ſuffuſion in the eyes, which often ſhed involuntary tears, and the pupil of which was in a conſtant tremulous motion, as it is to this day, of an almoſt inſupportable pain in the ſtomach, of intolerable thirſt, of an unconquerable watchfulneſs, not having had the leaſt ſleep for the laſt eight and forty hours. Her thighs and legs were greatly ſwelled; and, finally, ſhe had almoſt intirely loſt all ſenſe and motion from the region of the loins to the extremities of her feet. The condition of Anne was not quite ſo bad. Her pulſe was leſs languid, and, in a manner, even; but ſhe complained of very ſharp pains in the head, very troubleſome prickly heat in her feet, attended with ſuch a trembling and weakneſs, that ſhe could not ſtand upon them. As to Margaret, all her complaints amounted to no more then a pain in the ſtomach, and a difficulty of reſpiration, which, however, did not occaſion any diſorder in her pulſe.

In all very ſingular accidents, like this under our conſideration, it is uſual with thoſe who flock about the ſufferers, eagerly to enquire from their own mouths the hiſtory of their misfortunes, and every minute circumſtance that attended it. We may, therefore, imagine, that theſe poor women muſt have had many enquiries to anſwer concerning what happened them while buried under the valanca; ſuch as, what were their firſt thoughts on finding themſelves ſhut up on every ſide, what they ſaid to each other, what ſchemes they formed for their relief, what they lived on, in what poſture they lay, what cold they ſuffered, what ſleep they had, and ſuch other particulars, as a laudable curioſity might naturally be ſuppoſed to ſuggeſt. And, indeed, the phyſician himſelf, who was firſt called upon to their relief, found himſelf tempted to aſk theſe queſtions; but reflecting how improper it was to make them ſpeak much in their preſent condition, he not only checked his own curioſity, but that of others, and therefore enjoined them for ſome time to a ſtrict ſilence. As to food, he ordered them every three hours, as much veal broth and goats milk their ſtomach could bear, with water to extinguiſh an intenſe thirſt, they continually laboured under. But whatever they put into their mouths, it appeared bitter to them, particularly water, though of different kinds, and from different ſprings, and no ſuch taſte could be perceived in it by the phyſician or thoſe about them. This ſenſation of bitterneſs laſted in the two eldeſt about fifteen days, when it began gradually to wear off, ſo as to be entirely gone in a month. To this ordinary diet of theirs, was added a ſpoonful of generous wine twice a day. Margaret was the firſt to recover her primitive ſtrenght, for eight days after ſhe got out of her bed, ſhe was ſo ſtrong and hearty, that no one would imagine ſhe had ſuffered any thing; hence in a few days ſhe returned to her uſual kind of life. This was not the caſe with Anne; for, though ſhe every day grew better and better, it was, notwithſtanding, twenty days before ſhe found herſelf well enough to quit her bed for good and all. Theſe women lived for ſome time on the diet preſcribed by doctor Nicolai, and the doſe of wine being encreaſed in ſeven days, began to reſtore them to their appetites. Their next diet conſiſted of barley gruel boiled without broth, freſh eggs, and a little wheat bread. Theſe precautions anſwered ſo well, that Anne was almoſt entirely recovered by the beginning of June, and in a few days after in a condition to return to her uſual country labour. The only thing ſhe ſtill complained of, was a pain in the right knee, which often awakened her in the night, and afflicted her moſt on cloudy and blowing weather. The laſt of all to recover, as I have already ſaid, was the oldeſt Mary Anne. Though the food given them, was of the moiſteſt kind, no ſtools could be obtained from her for fifteen days, whereas Anne had them in two days; and theſe two were very black, and ſo hard, as to be attended with great pains. For the firſt five days ſhe never ſhut her eyes; and the little ſleep ſhe had on the ſixth night, was attended with a difficulty of reſpiration, interrupted by frequent ſtartings, and particularly by frightful dreams, which afflicted her bitterly, ſuch as the tumbling down about her ears, of the ſtable, in which, ſhe, her ſiſter-in-law and her daughter, had been miraculouſly preſerved. Theſe terrors leſſened by degrees, and the twelfth night, for the firſt time, ſhe ſlept ſoundly for four hours, after which ſhe ſeemed to be new born and continued to enjoy that ineſtimable bleſſing. The quantity of her evacuations by urine increaſed proportionally; and in conſequence of it, the ſwelling in her legs and thighs gradually diminiſhed; but as to her ſtomach and eyes, there did not appear in them any great amendment. She could hardly diſtinguiſh any objects and generally ſaw them double; the trembling of the pupil, and the involuntary flow of tears, ſtill continuing; and though this complaint went off, in proportion as ſhe was admitted to a greater quantity of ſolid food and of wine, nevertheleſs it muſt have required a long time; the acute pains returning ſuddenly, as often as ſhe attempted to take of theſe, more than her ſtomach could bear. However, in about ſix weeks, ſhe was able, with ſome difficulty, to get out of bed, and take a few ſteps, ſupported by her huſband and her ſiſter-in-law. This poor woman had ſuffered a great deal more than her daughter, or her ſiſter-in-law, and therefore took a longer time to recover her ſtrength and ſpirits. At length, however, at the end of two months, ſhe began to walk about, though ſtill complaining of pains in both her legs, the palpitation in her eyes, and a pain in her ſtomach, which encreaſed in proportion as ſhe recovered in other reſpects, ſo as to render her utterly unable to return to thoſe country labours, in which before her misfortune, ſhe uſed to be employed.

Theſe three poor women, with Joſeph Roccia, came on the twenty-fourth of July to the baths of Valdieri, to implore the further aſſiſtance of our benevolent ſovereign, who received them with all that goodneſs he generally ſhews to all his ſubjects, thoſe eſpecially who have met with any misfortunes; and ordered them a new and plentiful ſupply. The day before they ſet out from Bergemoletto, which was between eight and nine miles from the baths, and communicates with them by a very tireſome and diſagreeable road, paſſing through they *Foreſta* of Valdieri, called the

Deſartet, where the poor people ſpent the night in the houſe of an Alpineer; and the day following arrived at the baths by eight o'clock in the morning. They lay but one night at this place, for on the twenty-fifth they ſet out again by the ſame road, ſtopping at night in the houſe of the Alpineer, who had entertained them in their way to the baths, and from thence returned to Bergemoletto. I converſed with them the whole day, now with one, and now with another, very minutely concerning their ſtate of health, the life they led before the valanca had ſhut them up in the ruins of the ſtable, and all the time they were confined, their converſation in that miſerable condition; and, in ſhort, every thing that had happened them to the day they had been dug out.

Mary Anne, when I ſaw her, which was the twenty-fourth of July, 1755, was about forty years old, very thin viſaged, lean, almoſt entirely bald, troubled from time to time with pains of the head, which ſometimes aroſe in the hind, ſometimes in the fore-part, now in one place, and now in another, with protuberances in the feet, and the glands ſwelled to ſuch a degree, as to retain the hollow made by preſſing them with the finger. The pupils of her eyes were greatly dilated, and in a conſtant tremor; and the eyes of a reddiſh colour. She could not diſcover diſtant objects, thinking ſhe had always before her eyes a thick fog, or impenetrable darkneſs. She often complained of thirſt, and a prickly pain all over her body. She had no ſenſation of hunger, and being, by my advice, offered a meſs of vermicelli broth, in which I had ſteeped a little bread, ſhe found herſelf obliged to ſtop and reſt herſelf a little, after every half dozen ſpoonfuls, ſo that it took her a good half hour to eat a porringer of it, which might contain ſomething more than a pound. She eat very little meat, and drank thrice, half a glaſs of pure wine; ſaying, that this was the only thing which gave her ſtrength, and leſſened the pains of her ſtomach, which returned every time ſhe took any other food. All her animal functions were regular, and two days before the diſcharges peculiar to her ſex had ſtopt in her and her ſiſter-in-law. From the ſecond, of their being buried under the valanca, they had no diſcharges of this kind, till about the twentieth of June, and they returned again the twentieth of July. She generally had from five to ſix hours ſleep every night, but her ſleep was often interrupted by confuſed dreams and ſudden ſtarts. All the foregoing parts of her life, ſhe had enjoyed perfect health, with a very ſharp and quick ſight, free from any trembling of the pupil, or the leaſt diſorder or ſickneſs of any kind. Towards the end of Spring, and during the ſummer and autumn months, ſhe uſed to be conſtantly employed, even from ſun-riſe in the fields, the woods, and the meadows, laying up a ſtock of priviſions for winter, which ſhe ſpent with her huſband in Bergemoletto. About the age of twenty-two, ſhe married Joſeph Roccia, and had at ſix births, three boys and three girls, remaining each time, like the reſt of the country women, but very few days within doors, before ſhe returned to her wonted labour. She ſuckled all her children. She lived upon milk, water, garden-ſtuff, barley, and ſometimes a little wheat bread.

Anne, about twenty-four, of a robuſt and ſanguine conſtitution, was not ſo lean or pale-faced. She retained no other ſigns of all ſhe had ſuffered in her thirty-ſeven days burial, but a great thirſt, which often tormented her, and that troubleſome pain of the right knee, which returned from time to time in cloudy and ſtormy weather; and after ſtanding a long time, or walking too much. Whatever vegetable food came in her way, ſhe eat it with a good reliſh and appetite, and drank wine in a middling quantity. By what I have already ſaid of Margaret, a girl of about eleven, the reader may gueſs that ſhe was now very well, indeed in the beſt ſtate of health; as, in fact, I ſaw her, tall and hearty, fat and freſh coloured. She worked, as much as her tender age would permit, in the fields, helping her father, brother, and her aunt, to lay in a ſtock of proviſions for the enſuing winter.

Such was the condition of Mary Anne, Anne, and Margaret Roccia, on the twenty-fourth of July. It is now proper I ſhould ſay ſomething of the moſt marvellous circumſtance, attending this very ſingular and ſurpriſing accident, I mean their manner of ſupporting life, during ſo long and cloſe a confinement. I ſhall relate what I have heard of it from their own mouths, being the ſame, in ſubſtance, with what count Nicholas de Brandizzo, intendant of the city and province of Cuneo, heard from them on the ſixteenth of May, when, by order of our moſt benevolent ſovereign, he repaired to Bergemoletto, effectually to relieve theſe poor women, and the reſt of the inhabitants, who had ſuffered by the valanca.

To begin then; on the morning of the twenty-ninth of March, our three poor women, expecting every minute to hear the bell toll for prayers, had in the mean time, taken ſhelter from the rigour of the weather, in a ſtable built with ſtones, ſuch as are uſually found in theſe quarters, with a roof compoſed of large thin ſtones, not unlike ſlate, laid on a beam ten inches ſquare, and covered with a ſmall quantity of ſtraw, and with a pitch ſufficient to carry off the rain, hail or ſnow, that might fall upon it. In the ſame ſtable were ſix goats, (four of which I heard nothing of) an aſs and ſome hens. Adjoining to this ſtable, was a little room, in which they had fixed a bed, and uſed to lay up ſome proviſions, in order to ſleep in it in bad weather without being obliged to go for any thing to the dwelling-houſe, which lay about one hundred feet from it. I have already taken notice, that Mary

Anne was looking from the door of the ſtable at her huſband and ſon, who were clearing the roof of its ſnow, when warned by a horrible noiſe, the ſignal by which the Alpineer knows the tumbling of the valancas, ſhe immediately took herſelf in, with her ſiſter-in-law, her daughter, and her little boy of two years old, and ſhut the door, telling them the reaſon for doing it in ſuch a hurry. Soon after they heard a great part of the roof give way, and ſome ſtones fall on the ground, and found themſelves involved on all ſides with a pitchy darkneſs; all which they attributed, and with good reaſon, to the fall of ſome valanca. Upon this, they for ſome time thought proper to keep a profound ſilence, to try if they could hear any noiſe, and by that means have the comfort of knowing that help was at hand; but they could hear nothing. They therefore ſet themſelves to grope about the ſtable, but without being able to meet with any thing but ſolid ſnow. Anne light upon the door, and opened it, hoping ſhe had found out a way to eſcape the imminent danger they thought they were in of the buildings tumbling about their ears; but ſhe could not diſtinguiſh the leaſt ray of light, nor feel any thing but a hard and impenetrable wall of ſnow, with which ſhe acquainted her fellow priſoners. They, therefore, immediately began to bawl out with all their might; help, help, we are ſtill alive; repeating it ſeveral times; but not hearing any anſwer, Anne put the door too again. They continued to grope about the ſtable, and Mary Anne having light upon the manger, it occurred to her, that, as it was full of hay, they might take up their quarters there, and enjoy ſome repoſe, till it ſhould pleaſe the Almighty to ſend them aſſiſtance. The manger was about twenty inches broad, and lay along a wall, which, by being on one ſide ſupported by an arch, was enabled to withſtand the ſhock, and upheld the chief beam of the roof, in ſuch a manner, as to prevent the poor women from being cruſhed to pieces by the ruins. Mary Anne placed herſelf in the manger, putting her ſon by her, and then adviſed her daughter and her ſiſter-in-law to do ſo too. Upon this, the aſs which was tied to the manger, frightened by the noiſe, began to bray and pranſe at a great rate; ſo that, fearing leſt he ſhould bring the parapet of the manger, or even the wall itſelf about their ears; they immediately untied the halter, and turned him adrift. In going from the manger, he ſtumbled upon a kettle that happened to lie in the middle of the ſtable, which put Mary Anne upon picking it up, and laying it by her, as it might ſerve to melt the ſnow in for their drink, in caſe they ſhould happen to be confined long enough to want that reſource. Anne, approving this thought, got down, and groping on the floor till ſhe had found it, came back to the manger, and put it where her ſiſter-in-law deſired her. It ſeems, the evening before, one of the goats had dropt two dead kids, upon which, Joſeph concluded, that ſhe muſt be greatly out of order, and being deſirous (ſuch is the affection of theſe poor peaſants for their cattle, from whom they derive ſo much profit, and in a manner, their whole ſubſiſtence) to relieve the poor creature, had cauſed a meſs of rye porridge to be made for her, and that ſhe might get it the the warmer, had carried it to her in the kettle, in which it had been prepared.

In this ſituation the good women continued many hours, every moment expecting to be relieved from it; but, at laſt, being too well convinced, that they had no immediate relief to expect, they began to conſider how they might ſupport life, and what proviſions they had with them for that purpoſe. Anne recollected, that the day before ſhe had put ſome cheſnuts into her pocket, but, on counting them, found they amounted only to fifteen. Their chief hopes, therefore, and with great reaſon now reſted on thirty or forty cakes, which two days before had been laid up in the adjoining room. The reader may well imagine, though Anne had never told me a word of it, with what ſpeed and alertneſs ſhe muſt, on recollecting theſe cakes, have got out of the manger, to ſee and find out the door of the room where they lay; for it is natural with us to be in a great hurry to put in order and make ready, whatever we judge may be wanting to us in any great danger. Accordingly ſhe got out of the manger; but it was to no purpoſe; ſhe roved and roved about the ſtable to find out what ſhe wanted, ſo that ſhe was obliged to come as ſhe went, and take up her ſeat again amongſt her fellow ſufferers, who ſtill comforted themſelves with the hopes of being ſpeedily delivered from that dark and narrow priſon. In the mean while, finding their appetite return, they had recourſe to their cheſnuts. Margaret and her brother had had their breakfaſt; ſo that it was judged they could not ſuffer much by not eating any more that day; but

Mary Anne and Anne eat two cheſnuts each, and took a little ſnow, which they half melted with the heat of their hands. The reſt of the cheſnuts they reſerved for a future occaſion. They then addreſſed themſelves to God, humbly beſeeching him to take compaſſion of them, and vouchſafe in his great mercy to reſcue them from their dark grave, and from the great miſeries they muſt unavoidably ſuffer, in caſe it did not pleaſe him to ſend them immediate aſſiſtance. They ſpent many hours in ejaculations of this kind, and then thinking it muſt be night, they endeavoured to compoſe themſelves. Margaret and the little boy, whoſe tender years prevented their having any idea of what they had to ſuffer in their wretched ſituation, or any thought of death, and of what they muſt ſuffer, before they could be relieved, fell quietly aſleep. But it was otherwiſe with Mary Anne and Anne, who could not get the leaſt reſt, and ſpent the whole night in prayer, or in ſpeaking of their wretched condition, and comforting one another with the hopes of being ſpeedily delivered from it. As it ſeemed to them, after many hours, that it was day again, they endeavoured to keep up their ſpirits with the thoughts, that Joſeph with the reſt of their friends and relations not getting any intelligence of their ſituation, would not fail of doing all that lay in their power to come at them. The ſenſation of hunger was earlieſt felt by the two youngeſt; and the little boy crying out for ſomething to eat, and there being nothing for him but the cheſnuts, Anne gave him three, and three more to her ſiſter-in-law, and three to her niece, keeping the other four for herſelf.

I ſaid, that theſe women ſeemed to have ſome notion of the approach of day and night, but I ſhould never have dreamed in what manner this idea could be excited in them, ſhut up as they were in a body of ice, impervious to the leaſt ray of light, had not they themſelves related it to me. The hens ſhut up in the ſame priſon, were it ſeems the clocks, which by their clucking all together, made them think the firſt day that it was night, and then again after ſome interval that it was day again. This is all the notion they had of day and night for two weeks together; after which, not hearing the hens make any more noiſe, they no longer knew when it was day or night. I do not remember to have read in any of the writers of natural hiſtory, that hens ſhut up in a very dark place, where no noiſe could reach them, cluck at the approach of day and night, or only at indeterminate hours. This I know, indeed, that they have been ſometimes obſerved in great eclipſes of the ſun, to gather together with a great noiſe, and retire to their rooſting places. I know, too, that it is an obſervation of the peaſants, that they do the ſame in cloudy and dark weather, eſpecially during the ſummer months, calling upon each other, in their own language, as it were, to avoid the ſtorm. Poulterers, likewiſe, affirm, that when they go, even by night, to catch any chickens in the rooſt, theſe birds awake and cluck at the leaſt noiſe; but that they cluck at theſe ſtated periods, independent of any external ſign, is a thing I have not as yet been able to determine, though with that view I tried the following experiment. I placed eight hens and four pullets, with a ſufficient quantity of food and water, in a very dark place, and to the beſt of my judgment beyond the reach of any noiſe. And then, every morning an hour before day-break, and every evening at night fall, for five days together, I poſted myſelf ſoftly as I could, near the place where they were confined, to hear whether I could diſcover by their clucking any marks of their being able to diſtinguiſh day and night; but with all my diligence and attention, I could never perceive that they made the leaſt noiſe. I muſt own, indeed, that as I had contrived to put them in a place, where no external noiſe could reach them, their clucking might not have reached me; and ſo that the very means I took to make the experiment exactly, might have entirely defeated it. On the other hand, having firſt put a peaſant in the ſame place, and made him imitate the clucking of a hen, I heard the noiſe he made, though ſtanding on the place, from whence I imagined I might have heard the hens themſelves, had they made any. But whatever the inſtinct of theſe creatures may be, the three women imagined that the noiſe of them, was a ſufficient ſignal to count their days by.

This day the poor women and the boy ſupported themſelves with their cheſnuts; and at the return of the uſual ſignal of night, the boy and Margaret went to ſleep; while the mother and aunt ſpent it in converſation and prayer. On the next day the aſs by his braying, gave now and then, for the laſt time, ſome ſigns of life. On the other hand,, the poor priſoners had ſomething to comfort themſelves with; for they diſcovered two goats making up to the manger, and on feeling them, found one to be a goat in kid, whoſe time would be up towards the middle of April, the other one of thoſe, which at this time uſed to ſupply them with milk. This, therefore, was a joyful event, and they gave the goats ſome of the hay they ſat upon in the manger, ſhrunk up with their knees to their noſes. It then came into Anne's head to try if ſhe could not get ſome milk from the milch goat; and recollecting, that they uſed to keep a porringer under the manger for that purpoſe, ſhe immediately got down to look for it, and happily found it. The goat ſuffered herſelf to be milked, and yielded almoſt enough to fill the cup, which contained above a pint. On this they lived the third day. I could not, on this occaſion, but greatly admire the natural ſimplicity and honeſt candour of Anne, who being aſked, if ſhe, who milked the goat, divided the milk with her fellow-ſufferers, and in what manner, made anſwer. " 'Twas I that milked the goat, and after drinking as much of the milk, as I thought requiſite to ſupport nature, I reached the porringer to my ſiſter, who ſate next to me, and ſhe after taking ſome of it, diſtributed the remainder to her Margaret, and the little boy. I began to take compaſſion of myſelf, but without forgetting my companions." The night following the boy and the girl ſlept as uſual, while neither of the two others cloſed their eyes. Who can imagine how long the time muſt have appeared to them, and how impatient they muſt have been to ſee an end to their ſufferings? This, after offering their prayers to the almighty, was the conſtant ſubject of their converſation. " O, my huſband, Mary Anne uſed to cry out, if you too are not buried under ſome of the valancas and dead, why do not you make haſte to give me, your ſiſter, and children, that aſſiſtance we ſo much ſtand in need of. ? We are thank God, ſtill alive, but cannot hold out much longer, ſo it will ſoon be too late to think of us. Ah, my dear brother, added Anne, in you next to God, have we placed all our truſt. We are alive, indeed, and it depends upon you to preſerve our lives, by digging us out of the ſnow and the ruins, in which we lie buried." But let us ſtill hope, both of them added, that as God has been pleaſed to ſpare our lives, and provide us with the means of prolonging it, he will ſtill in his great mercy put it into the hearts of our friends and relations to uſe all their endeavours to ſave us : Yes, they know that we were in the ſtable, and ſeeing it covered with ſnow, they will ſpare no pains to get at us, and find whether we are dead or alive." To this diſcourſe ſucceeded new prayers, after which they compoſed themſelves as well as they could, in order to get, if poſſible, a little ſleep.

The hens having given the uſual ſignal of the return of day, they began again to think on the means of ſpinning out their lives. Mary Anne bethought herſelf anew of the cakes put up in the adjacent room; and upon which, could they but get at them, they might ſubſiſt a great while without any other nouriſhment. On the firſt day of their confinement, they had found in the manger a pitch fork, which they knew uſed to be employed in cleaning out the ſtable, and drawing down hay through a large hole in the hay-loft, which lay over the vault. Anne obſerved, that ſuch an inſtrument might be of ſervice in breaking the ſnow, and getting at the cakes, could they but recover the door leading into the little room. She, therefore, immediately got out of the manger, from which ſhe had not ſtirred ſince the firſt day; and groping about, ſometimes meeting with nothing but ſnow, ſometimes with the wall, and ſometimes looſe ſtones, ſhe, at length, light upon a door, which ſhe took for the ſtable door, and endeavoured to open it as ſhe had done the firſt day, but without ſucceſs; an evident ſign that the ſuperincumbent ſnow had acquired a greater degree of denſity, and preſſed more forcibly againſt it. She, therefore, made ſtep by ſtep, the beſt of her way back to the manger, all the time converſing with her fellow ſufferers; and taking the fork with her, continued to rove and grope about, till at laſt ſhe light upon a ſmooth and broad piece of wood, which to the touch had ſo much the appearance of the little door, as to make her hope ſhe had at laſt found what ſhe had been ſo earneſtly looking for. She then endeavoured to open it with her hands, but finding it impoſſible, told the reſt that ſhe had a mind to employ the pitch fork; but Mary Anne diſſuaded her from doing ſo. "Let us, "ſaid ſhe, leave the cakes where they are "a little longer, and not endanger our "lives any further, by endeavouring to "preſerve them. Who knows but with

“ the fork, you might make ſuch deſtruc-
“ tion, as to bring down upon our heads,
“ that part of the ſtable that ſtill continues
“ together, and which, in its fall, could
“ not fail of cruſhing us to pieces. No,
“ God keep us from that misfortune.
“ Lay down your fork Anne, and come
“ back to us, ſubmitting yourſelf to the
“ holy will of the Almighty, and patiently
“ accept at his hands whatever he may
“ pleaſe to ſend us.” Anne, moved by ſuch ſound and affecting arguments and reaſons, immediately let the fork fall out of her hands, and returned to the manger. “ Let
“ us, continued Mary Anne, let us make
“ as much as we can of our nurſing goats,
“ and endeavour to keep them alive by
“ ſupplying them with hay. Here is a
“ good deal in the manger, and it occurs
“ to me, that when that is gone, we may
“ ſupply them from another quarter, for
“ by putting up my hand, trying what
“ was above me, I have diſcovered that
“ there is hay in the loft, and that the hole
“ to

" to it is open, and juſt over our heads;
" ſo that we have nothing to do, but to
" pull it down for the goats, whoſe milk
" we may ſubſiſt upon, till it ſhall pleaſe
" God to diſpoſe otherwiſe of us."

This reaſoning, was not only ſound in itſelf, but ſupported by facts; for ever ſince their confinement, they had heard ſtones fall from time to time upon the ground, and theſe ſtones could be no others than thoſe of the building, which the ſhock of the valanca had firſt looſened, and which the weight it every day acquired by encreaſing in denſity, afterwards enabled it to diſplace. Wherefore, had ſhe happened to diſturb with the pitch-fork, as there was the greateſt reaſon to fear ſhe might, any of thoſe parts, which, united together, ſerved to keep up the beam that ſupported the great body of ſnow, under which they lay buried, the fall of the ſtable, and their own deſtruction, muſt have infallibly been the conſequence of it. I do not deny but that this beam was ſtrong enough to bear a much greater weight. For, ſuppoſing its preſent poſition in the ſtable, the ſame with that in which it was afterwards found, and which I ſhall preſently deſcribe, the cavity formed by it was ſix feet long, and two feet and a half high at one end, the length therefore of that part of the beam, which lay over this cavity, was about ten feet and a half. Furthermore, ſuppoſing that this cavity was four feet broad, the roof ſupported by this beam muſt have meaſured ſix and twenty ſuperficial feet, which multiplied by forty two feet, the height of the valanca, give one thouſand and ninety-two cubit feet for the quantity of ſnow ſupported by the roof. By experiments made to aſcertain the quantity of air, that flies off in the melting of ſnow, which experiments I ſhall preſently relate; it appears that the volume of ſnow compreſſed, and ſtrongly ſqueezed into a veſſel, is to the volume of the ſame ſnow reduced to water, as ſeventeen to ſix; wherefore, ſuppoſing the ſnow upon the roof to have been more condenſed to a much greater degree, we may allow that the volume of it, in this its ſolid form, was to its volume when melted, as two to one; ſo that the one thouſand and ninety-two feet of ſolid ſnow, muſt yield five hundred and forty-ſix cubic feet of melted ſnow. Now, a cubic foot of water, weighs about three hundred and twelve pounds, therefore the weight of the ſnow ſupported by the roof, amounted to no leſs than one hundred and ſeventy thouſand, three hundred and fifty-two pounds. By obſervations made on the ſtrength of timber, it appears that a beam of larch, clean and free from knots, and every other imperfection, eſpecially at or near the middle, eleven inches ſquare, and ſix feet and a half long, can bear, if placed horizontally on its two extremities, a weight of two hundred thouſand pounds, ſuſpended to the middle of it; and that it can bear a ſtill greater weight in an oblique poſition. It therefore follows, that as in the preſent caſe, the beam did not lie horizontally,

zontally, and had beſides the weight of the ſnow diſpoſed over its whole length, and not confined to its middle, it could not but eaſily bear it; ſince there wanted twenty-nine thouſand ſix hundred and forty-eight pounds of the total weight which it might have ſupported, even in the moſt diſadvantageous poſition and circumſtances. But after all, had the parts which kept up the beam, been removed, it muſt then, with all the great weight upon it, have tumbled into the ſtable, to the unavoidable deſtruction of the poor people confined in it.

This day the ſenſation of hunger was more and more lively and troubleſome, without their having any thing to allay it with but ſnow, and the milk yielded them by one of the goats their fellow priſoners. I ſay one of the goats, for as yet they had milked but one of them, thinking it would be uſeleſs, or rather hurtful, even if they could, to take any milk from that in kid. Anne had recourſe to the other, and in the whole day, got from her about two pounds of milk, on which, with the addition of a little ſnow, picked up in the corner between the beam and the floor, they ſubſiſted. This day, too, they began to be troubled with a great dryneſs in their mouths, and a violent thirſt, which they endeavoured to allay, by often putting ſnow into their mouths. It was the laſt day of Mary Anne's having all the benefits of nature in a regular courſe, having for the following thirty-three days, had no ſenſible evacuation but that of urine, which the two others likewiſe continued always to have, with this difference, that Anne had but two ſtools the whole time, whereas Margaret had one every five or ſix days. Anne, Margaret, and the little boy, ſlept the next and all the following nights; but as to Mary Anne, ſhe paſſed it as ſhe had done the preceding nights; nor did ſhe ever, during the thirty-ſeven days of her confinement, cloſe her eyes, and take any ſleep, except three times, and that, as well as ſhe could gueſs, for about two hours each time.

The poor creatures ſpent the fifth day in the ſame manner. The ſixth was attended with a new ſource of affliction and diſtreſs.

The little boy Antony, who ſubſiſted entirely on milk, not being able to bear the cold of the ſnow in his mouth, began on this day to complain of very cruel pains in his ſtomach and belly, which made him work and writh a thouſand and a thouſand ways without finding the leaſt eaſe or relief. The poor mother endeavoured to warm and cheer up the poor creature, by cloſing him to her boſom, the only way left her to do it. This gave him ſome eaſe, but he had but juſt ſtrength enough to taſte a little milk which was put to his lips. A good many hours after this, his pains returned, when his mother and his aunt, taking him by turns, on their laps, and cloſing him to their boſoms, did all their own wretched condition and ſituation would let them, to give him eaſe and quiet him. In this condition, the poor little creature lingered on in incredible pains, to the unſpeakable affliction of the poor women, who had forgot their own ſufferings to attend entirely to his. On the tenth day of his illneſs, reckoning the days by their uſual clock, viz. one of the hens that ſtill ſurvived, he was ſo very bad, as no longer to bear lying in his mother's or his aunt's lap; and therefore deſired to be ſtretched at length in the manger. This the tender mother complied with, and with much difficulty laid him alongſide herſelf, her great affection for him not permitting her, as long as ſhe could herſelf afford him any aſſiſtance, to part with him to his aunt or his ſiſter. In this ſituation, he did nothing but complain, his weak and piteous cries piercing deeper and deeper into the heart of the poor mother, who, though it was with the utmoſt difficulty ſhe could turn about in her confined ſituation, never ceaſed either warming his feet or mouth with her breath, or by ſtroking him with her hands, endeavouring to find out whether he was dead or alive. At length, after he had lain quiet for a little time, ſhe all at once found her fingers ſeized and ſqueezed by the death-cold hands of the poor innocent; which ſhe conſidered an evident ſign of his being near his end. She therefore took him up in the beſt manner ſhe could, laid him in her lap, and by ſtroaking with her hands, his already benummed legs and thighs, now too weak to ſupport his little emaciated body, and giving a thouſand kiſſes, and breathing frequently on his cold lips, in order to impart ſome heat to them, at laſt brought him to give a faint ſigh, on which dipping her trembling fingers into the milk, ſhe let a few drops of it fall into his mouth. Upon this, the poor creature cried out with another ſigh, "O my father, my father! and "he, too, is under the ſnow, O my fa-"ther, my father!" Theſe words were ſcarce out of his mouth, when the mother felt his head falling back upon her arm. The grief and affliction which the poor mother felt at this moment, the laſt for certain of her child's life, and the deep impreſſion made on her heart by his laſt words, "O my father, my father, he, too, is "under the ſnow; O my father, my father!" made her burſt out into a flood of tears, which from her cheeks trickled down on the face of her dead child, whom with repeated kiſſes, ſhe fain would have brought to life again. At length, his face being grown quite cold, and no motion remaining in his arms or legs, which when lifted up, fell back by their own weight, ſhe cried out to her ſiſter-in-law. "Ah, ſiſter, he is now dead indeed, my "boy is dead, who remembered his fa-"ther with his laſt breath. I have often "before heard the poor creature ſpeak of "his father, who indeed, is perhaps bu-"ried under the ſnow, and no longer in "the land of the living, as we are, through "the ſpecial mercy of the Lord, and now "he has mentioned him again with his "laſt breath. Who knows what will be-"come of us, who have ſuffered ſo much,

" and ſo long, by cold, by hunger, and
" by want of ſleep, in this dark dungeon?
" He, as more delicate and leſs inured
" to ſufferings is gone firſt, who knows
" which of us is next to follow him? O
" my dear child, have I loſt you at laſt."
The ſiſter, though ſorely afflicted at the loſs of her nephew, and touched by theſe words of Mary Anne; nevertheleſs, to leſſen in ſome manner, her extreme agony, took from her the dead body of the child, and after firſt ſtripping it of its cloaths, laid it in the furtheſt corner of her end of the manger.

The death of this poor child, proved the ſevereſt trial that the three women, the two eldeſt eſpecially, had to ſuffer during their long confinement; and from this unfortunate day, the fear of death, which they conſidered as at no great diſtance, began to haunt them more and more. Nor is it, I believe, any hard matter to conceive that this muſt have been the caſe, conſidering that we are more moved by thoſe events which nearly concern us, and we ſee happen to perſons in the ſame ſituation with ourſelves, than by thoſe, which we only think of as poſſible; and therefore may flatter ourſelves with the hopes of being able to eſcape. The little nouriſhment, which the goat yielded the poor women, had made them ſuffer greatly on the preceding days; they were, beſides, benumbed, or rather frozen with the intenſe cold. Add to this, the neceſſary, but inconvenient and tormenting poſture of their feet, knees, and every other part of their bodies; the ſnow, which melting over their heads, perpetually trickled down their backs, ſo that their clothes, and their whole bodies were perfectly drenched with it: the ſtench ariſing from the dead bodies, and their own, and the goats excrements, were ſuch, that they were often on the point of ſwooning away with it, and obliged to keep themſelves from fainting, by handling the ſnow, and putting ſome of it into their mouths: the thirſt with which their mouths were conſtantly burnt up; the thoughts, that in all this time no one had been at the pains to look for and relieve them; the conſideration that, all they had hitherto ſuffered, was nothing in compariſon of what they had ſtill to ſuffer before they could recover their liberty, or ſink under the weight of all the evils which encompaſſed them; all theſe, certainly, were circumſtances ſufficient to render them to the laſt degree, wretched and miſerable. But after all, the ſight of death, till this day, was but a pretty diſtant proſpect; for though it was preſent to their thoughts, yet, as they did not behold it with their own eyes, they flattered themſelves that they might one way or another, eſcape it. But now that they ſaw it come down among them, it was impoſſible that they ſhould not be to the laſt degree afflicted and terrified at ſuch ſhocking company. Add to this, that the milk of their fond and loving nurſe, fell away little by little, till at length, inſtead of about two pounds, which ſhe, in the beginning, uſed to yield, they could not now get ſo much as a pound from her. The hay that lay in the manger was all out, and it was but little the poor women could draw out of the hole which lay above them; ſo that as the goats had but little fodder, little ſuſtenance could be expected from that which they thought proper to milk. Theſe animals were become ſo tame and familiar, in conſequence of the fondneſs ſhewn them, that they always came on the firſt call to the perſon that was to milk them, affectionately licking her face and hands. Anne, encouraged by this tameneſs of theirs, bethought herſelf of accuſtoming them to leap upon the manger, and from thence upon her ſhoulders, ſo as to reach the hole of the hay-loft, and feed themſelves; ſo apt is hard neceſſity to inſpire ſtrength and ingenuity. She began by the goat that yielded them milk, helping her up into the manger, and then putting her upon her ſhoulders. This had the deſired effect, the animal being thereby enabled to reach much farther with its head, than they could with their hands. They did then the ſame by the other goat, from whom, as ſoon as ſhe ſhould drop her kid, they expected new relief; ſhe too, in the ſame manner, found means to get at the hay, which afforded the poor women ſome relief in the midſt of their preſſing neceſſity. After this day, the goats required no further aſſiſtance, they ſo ſoon learned to leap of themſelves on the manger, and from thence on the womens ſhoulders. But we muſt not conclude that hunger was the chief of the poor womens ſufferings; far from it. After the firſt days, during which it proved a ſore torment to them, they, through neceſſity, grew ſo accuſtomed to very little, and very light nouriſhment, that they no longer felt any ſenſation of that kind, but lived contentedly on the ſmall quantity of milk they could get from their goat, mixed with a little ſnow. Their breath was what gave them moſt uneaſineſs; for it began to be very difficult on the fifth or ſixth day, every inſpiration being attended with the ſenſation of a very heavy and almoſt inſupportable load upon their cheſts. Beſides this, the ice-cold water, which was conſtantly dropping on their bodies, and the continual bitings of the lice, with which, they were, in a manner, eaten up, proved a perpetual ſource of uneaſineſs and torment to them. This laſt plague there was no getting rid of, and therefore they were obliged to make a virtue of neceſſity, and patiently ſubmit to it. As to the conſtant dripping, with which they were almoſt frozen to death, they endeavoured to guard againſt it; Margaret, by putting the kettle on her head; and her mother and aunt, by wrapping themſelves up in the things of which Anne had ſtript the little boy's body, eſpecially about the head, as the part which ſtood moſt in need of defence. This covering afforded the two eldeſt ſome relief, but it was of ſhort duration; for the cloaths, when ſaturated with water, proved a heavy a heavy burthen, and a much greater evil than what they endeavoured to ſhun by uſing them, ſo that they were at laſt forced to throw them off, and ſubmit entirely to God's providence. Anne was for having the kettle ſerve as an umbrella to all the three; and with this view, put a little of it over her head; but the affectionate mother, having her daughter's welfare more at heart than her own, left her ſhare to the girl, and found means to make the aunt follow her example; ſo that not a word more paſſed upon this article.

They now had loſt all means of gueſſing at the returns of day and night; and their only employment was to recommend themſelves fervently to God, beſeeching him to take compaſſion of them, and at length, put an end to their miſeries, which encreaſed from day to day. At laſt, their nurſe growing dry, they found themſelves without any milk, and obliged to live upon ſnow alone for two or three days, Mary Anne not approving an expedient propoſed by her ſiſter. This was to endeavour to find out the carcaſſes of the hens; for as they had not heard them for ſome days paſt, they had ſufficient reaſon to think they were dead; and then eat them, as the only thing with which they could prolong life. But Mary Anne, rightly judging that it would be almoſt impoſſible to ſtrip them clean of their feathers, and that beſides, the fleſh might be ſo far putrefied, as to do them more harm than good, thought proper to diſſuade her ſiſter from having recourſe to this expedient, at leaſt for the preſent. " Let us endeavour, ſaid ſhe, " ſince we have already ſuffered ſo much, " to put up with the ſnow, and try if we " cannot, by means of it, hold out a little " longer, and keep body and ſoul toge- " ther." But the unſpeakable providence of God, whoſe will it was they ſhould live, provided them with new means of ſubſiſtence, when leaſt they expected it, by the kiddening of the other goat. They had often thought of this, and conſulted together what they ſhould do if they ſhould then happen to be alive. They reſolved, in order to prevent the kid's robbing them of any milk, to kill it the minute it was dropt, and perhaps divide it amongſt themſelves and eat it, in caſe they have nothing elſe left to live upon. The cries and throws of the goat at length giving notice, that ſhe was about to drop her burthen, they called her to them, and found it to be really the caſe. Anne, therefore, helped the poor thing into the manger, and, delivering her of a kid, gave it to the ſiſter,. who immediately killed it. She then got the dam to leap upon her ſhoulders, and feed herſelf. By this event, they judged themſelves to be about the middle of April; wherefore, after offering God their moſt humble thanks, for having preſerved them ſo long, in the midſt of ſo many, and ſuch great difficulties, they again beſeeched him to aſſiſt them effectually, till they could find an opportunity of eſcaping their doleful priſon, and ſee an end to their great ſufferings. Their hopes of this their humble ſupplication being heard, were raiſed on the appearance of this new ſupply, and on their reflecting that the ſnow begins to thaw in April; in conſequence of which, either that about the ſtable would ſoon diſſolve enough to let ſome ray of light break in upon them, or at leaſt put their relations upon endeavouring to get at their bodies, in order to bury them. Mary Anne told me, that, though ſhe was thoroughly ſenſible of the badneſs of her condition, in which it was impoſſible for her to hold out much longer, and ſaw it every day grow worſe and worſe; ſhe never, however, deſpaired of her living to be delivered from it. She thought ſhe continually heard within her, a voice ſaying, " God will ſend you aſſiſtance; your " huſband has not forgot you, and is in- " tent upon recovering you; your bro- " thers in Demonte will never reſt till they " know with certainty whether you are " dead or alive." Now and then, however,

whilſt her ſiſter and daughter were aſleep, ſhe uſed to weep bitterly; one time thinking of the little appearance there was of her ever eſcaping, and that her huſband and the boy that was at work with him, were themſelves buried under the valanca, and dead; another time, reflecting on the death of her little boy, a preſage, as it were, to herſelf and her fellow ſufferers, of what they themſelves had to expect; now on her heavy ſins, in which the Lord might think proper to call her away. And ſhe ſometimes ſuffered herſelf to be ſo overcome by theſe reflections, that ſhe more than once feared her ſighs and ſobs would ſuffocate her. They once awakened Anne, who aſking her the cauſe of this her new grief, received for anſwer, that her tears were owing to her ſufferings, with which ſhe was already beyond meaſure afflicted, and yet increaſed from day to day, whilſt her ſtrength to bear them, continually diminiſhed. "God, replied the ſiſter, who "has aſſiſted us all this time, will not de-
"ſert

“ ſert us at preſent; let us patiently wait
“ his pleaſure with regard to us, and continue
“ to truſt in him our only refuge.
“ He has reſcued us from death, which
“ would certainly have been our lot, had
“ the ſtable been entirely demoliſhed. He
“ has not altogether deprived us of ſubſiſtence,
“ having left us two goats, from
“ whom, little as it is, we have obtained
“ ſome nouriſhment. He, notwithſtanding
“ the cold, with which we are almoſt
“ frozen to ice; notwithſtanding the water
“ with which we are almoſt drowned;
“ notwithſtanding all the other evils with
“ which we are ſurrounded, is graciouſly
“ pleaſed to grant us life; therefore let us
“ not grow weary of beſeeching him, effectually
“ to hear our prayers, and deliver
“ us from this dark grave.” Theſe, with other words full of hope and confidence, gave much comfort to Mary Anne, ſo that ſhe replied with a ſigh: “ You are
“ in the right, ſiſter, let us pray God not to
“ grow weary of protecting us, and beſeech

" him to inſpire, at leaſt my brothers, " to haſten to our aſſiſtance; from them I " firmly truſt in God to obtain it; for " they were not within the reach of the " valanca, which has overwhelmed us, " and perhaps your brother and my ſon " Anthony, and Joſeph Bruno, are, if it " ſhall ſo pleaſe God, to be our deli- " verers. I know how much they love " me, and what great lengths they would " go to aſſiſt me." With this, and ſuch like pious diſcourſe, the poor women endeavoured to comfort themſelves, and to keep up their ſpirits, in patient expectation of the happy moment they ſo much longed for. For my part, I cannot ſufficiently admire the courage and intrepidity of Anne, who told me, that in all this time, ſhe never let a tear eſcape her but once. This was on its occurring to her, that, as they muſt at length periſh for want, it might fall to her lot to die laſt. For the thought of finding herſelf amidſt the dead bodies of her ſiſter and her niece, herſelf too in a dying condition, terrified and afflicted her to ſuch a degree, that ſhe could no longer command her tears; but wept bitterly.

I obſerved, that the goat had kidded. This event afforded the poor women a new ſupply of milk, Anne for a while getting two porringers at a time from her, with which they recruited themſelves a little. But as the goats began to fall ſhort of hay, the milk of the only one that gave them any, began to leſſen in proportion, ſo that at length they ſaw themſelves reduced to a ſingle, and even half a porringer. It was, therefore, happy for them, that the time drew nigh, in which God had purpoſed to reſcue them from their horrible priſon and confinement, and put an end to their ſufferings. One time they thought they could hear a noiſe of ſome continuance at no great diſtance from them. This was probably the 20th, when the pariſh prieſt's body was found in the houſe number 19. And, upon it, they all together raiſed their weak and hoarſe voices, crying out, " Help, help :" but the noiſe ceaſed, and they this time neither ſaw or heard any thing elſe that might ſerve as a token of their deliverance being at hand. However, this noiſe alone was ſufficient to make them addreſs God with greater fervour than ever, beſeeching him to have compaſſion on them, and to confirm them ſtill more and more in their warm hopes, that the end of their long miſery was not far off. In fact, they again heard another noiſe, and that nearer them, as though ſomething had fallen to the ground. On this they again raiſed their voices, and again cried out: " Help, " help :" but no one anſwered, and ſoon after the noiſe itſelf entirely ceaſed. Their opinion concerning this noiſe, and in this they certainly were not miſtaken, was that it came from the people, who were at work to find them, and who left off at the approach of night, and went home with a deſign to return to their labour the next morning. After the noiſe of the body fallen to the ground in their neighbourhood, they ſeemed for the firſt time to perceive ſome glimpſe of light. The appearance of it ſcared Anne and Margaret to the laſt degree, as they took it for a ſure fore-runner of death, thought it was occaſioned by the dead bodies; for it is a common opinion with the peaſants, that thoſe wandering wild-fires, which one frequently ſees in the open country, are a ſure preſage of death to the perſons conſtantly attended by them, which ever way they turn themſelves; and they accordingly call them death-fires. But Mary Anne, was very far from giving into ſo ſilly a notion. On the contrary the light inſpired her with new courage, and ſhe did all that lay in her power to diſſipate the fears of her ſiſter and daughter, revive their hopes in God, and perſuade them that their deliverance and the end of all their ſufferings was at hand; inſiſting that, this light could be no other than the light of heaven, which had, at leaſt, reached the ſtable, in conſequence of the valanca's melting, and ſtill more in conſequence of the conſtant boring and digging into it, by their relations in order to come at their dead bodies. " Let us, continued ſhe, " my dear Anne and Margaret, let us " with redoubled fervour and joy thank " God, and humbly beſeech him to continue his protection to us, that we may " at laſt get alive out of this dungeon, in " which he has ſo miraculouſly preſerved " us. Let us thank him for his great " mercy towards us, and beſeech him not " to deſert us in theſe laſt moments. Let " us truſt in his promiſes, who ſays, I will " not forſake you, I will not abandon you. " To-morrow morning we ſhall again hear " them at work, and be convinced, that the " light we now ſee is the light of heaven, which " has, at laſt, found its way to our longing " eyes." Mary Anne gueſſed right what was to happen the next day, for it was the next day that Anthony deſcended into the ruins of the ſtable, and to his unſpeakable ſurpriſe found the poor women alive bleſſing and exalting the moſt high, and reſtored them from darkneſs to light, from danger to ſecurity, from death to life, by drawing them out of the manger, and removing them to the houſe of Joſeph Arnaud; where they continued to the end of July, living in the manner I have already related.

Thirty-ſeven entire days did theſe poor women live in the moſt horrible ſufferings occaſioned no leſs by filth and the diſagreeable poſture they were confined to, than by cold and hunger; but the Lord was with them. He kept them alive, and they are ſtill living, in a new cottage built the ſame year in the *Foreſta* of Bergemoletto, at no great diſtance from their former habitation. I ſhall relate in what manner they have lived ſince, and in what ſtate of health they now are. But ſhall firſt endeavour to account for their holding out ſo long in ſuch terrible circumſtances, the ſingularity of which has been matter of much inveſtigation with all thoſe, who have heard of this ſurpriſing event, and is apt to excite that laudable curioſity, which ſo much tends to the improvement of the ſciences: for it appears at firſt ſight, that, the exceſſive cold they themſelves own they ſuffered, or their almoſt total want of food, or the badneſs of the air, which on account of the narrow bounds of their priſon, they muſt have breathed again and again, until it had loſt all power of expanding and working their lungs; it appears. I ſay, at firſt ſight, that any of theſe circumſtances ſhould, alone, have been ſufficient to put a ſpeedy end to their lives. It is true, indeed, that their continuing ſo long in a place but twenty inches broad, with their backs to the wall, their toes under their hams, and their knees to their noſes, occaſioned in the two oldeſt ſuch violent complaints in the feet, that they have not as yet got the better of them: it is true, likewiſe, that their ſtomachs, through the ſmallneſs and lightneſs of their food, have ſuffered exceſſively; in ſhort, it is true, that the eyes of Mary Anne were rendered tremulous by the firſt rays of the ſun, that re-entered them, and that ſhe is loſing her ſight little by little: all this, no doubt, is very true; but it is likewiſe very true, that they were in the circumſtances already deſcribed, and continued in it a long while, and yet are ſtill alive: an event the like of which, as I obſerved at ſetting out, I do not remember to have ever heard or read of.

Scheuchzer relates, that in the country of Glaris, a boy driving home ſome cows, was overtaken and rolled up along with them by a valanca, which likewiſe covered a ſpring at which he happened to be watering them, and the field in which it lay. His relations loſt no time in trying for him by boring the ſnow with long poles, now in one place and now in another; but they could meet nothing like him the firſt day. The next day ſome neighbours, whom they had invited to their aſſiſtance, in turning over the ſnow, in order to find his dead body and bury it, to their very great ſurpriſe found him alive. A girl of fourteen, buried by another valanca in company with thirteen perſons, was dug out alive at the end of three days; but then ſhe was the only perſon that had the good fortune to eſcape. Six and twenty perſons were buried by a valanca at ſaint Theodore's; and Pietro Gulero, a man of eighty-five, was dug alive out of it at the end of three days. I omit other accounts given by Scheuchzer of perſons drawn alive out of valancas, after lying in them a few hours; knowing that ſuch things ſometimes happen in our own mountains, in which, towards Limone, as I have been told by a perſon of credit, a prieſt and two peaſants were in 1747, dug alive out of a valanca, in which they had lain three days. But I ſee no difficulty in accounting for all this; nothing more being requiſite, than that the ſnow ſhould be looſe and ſoft enough to let the unhappy priſoners make an opening to breathe by from their mouths to the open air. And, in fact, this is nearly the way, which the Laplanders, according to Scheffer, take in the open country to avoid being ſtifled by the great quantities of ſnow, that the weſterly winds often carry with them. "Unum genus eſt," writes Scheffer ſpeaking of theſe winds, "uti teſtati ſunt mihi "qui viderunt, ſurgens a mari, quod cum ſpirare incipit, denſas, craſſaſque media æſtate, dieque creat nebulas, quibus longior omnibus proſpectus intercipitur. Hyberno autem tempore tantam nivium dejicit vim, atque copiam, ut ſi quem deprehendat in campis, illi non aliud ſuperſit remedium, quam ut projectus in terram, veſte ſe operiat, obruique ſinat nivibus, donec tempeſtas deſierit." The difference is, that in all the accidents I have been juſt relating, the time, thoſe dug alive out of the ſnow had remained in it, was almoſt nothing to the thirty-ſeven days, which the poor women had been in queſtion had been buried in it. The ſame thing may be ſaid, if we conſider the ſmallneſs and lightneſs of their food during that very long period.

We have a great many accounts of people, who have lived for a long time without any kind of nouriſhment; but of theſe accounts, as ſome are true, ſo ſome are entirely falſe; and others partly true and partly falſe. Pechlin's little work, "De aeris, et alimenti defectu, et vitâ ſub aquis," has the following words in the beginning of the twelfth chapter. "Tot virorum eruditorum teſtimoniis, argumentiſque probata eſt abſtinentium hiſtoria, ut qui illam inficiari auſus ſit, etiam meridiani ſolis lucem negare videri velit. Ego quidem, ut non improbo inediæ quædam portenta, ſic non temere omnibus accedo; multa enim profecto ſunt fabuloſa, aliqua intra famam, plurima non niſi, certis circumſtantiis vera, alias falſa deprehenſa." And certainly it is the part of a prudent and circumſpect man not to ſwallow too readily what ſome people relate, merely with a view to ſurpriſe and aſtoniſh; but, on the other hand, it is equally his duty not to deny a thing ſtiffly, becauſe he does not comprehend it at firſt ſight: juſt as a man of ſenſe will neither decide peremptorily concerning things, for and againſt which, the proofs are equally probable; nor, on the other hand, ſpeak doubtfully of thoſe which are clear and evident; ſince to act in this manner, is to fight againſt truth, and to the utmoſt of our power ſtifle it. Now we need only give a look into Fernelius, Citeſius, Licetus, Lentulus, the *Journal des Sçavans*, the Memoirs of the Royal Academy of Sciences at Paris, the Eſſays and Obſervations of the Edinburgh Society, Vandermonde's Medicinal Journal, and other books, to meet with many hiſtories of this kind. In one of them, we read of a young woman, who, on falling out of a coach, and being trampled on the head by a horſe, and run over the back near the eleventh vertebra, by a wheel, was immediately ſeized with a vomiting of blood, which was followed by a high fever, accompanied with dangerous ſymptoms, and ſuch a conſtriction of the fauces, as for two years together, prevented her from ſwallowing more than a few crumbs of bread, two glaſſes of water, and a little ſyrup every twenty-four hours. In another place, we meet with another girl, who lived without any nouriſhment, liquid or ſolid, for three years. This girl was at firſt ſeized with a fever and a vomiting; then ſhe loſt her ſpeech, and became paralytical all the body over, except the head, in which the fauces alone were effected, and took an averſion to every kind of food. At the end of ſix months, ſhe recovered the uſe of her limbs, but her averſion to food continued, nor had ſhe any evacuation during the whole time. Her ſkin, indeed, retained its ſmoothneſs, but grew cold to ſuch a degree, that no rubbing or friction could bring any heat into it. We read of a third, who having little by little, loſt all ſenſation of hunger and thirſt, became at length ſo patient of abſtinence, that for ſome months together ſhe took no ſuſtenance. The news of which being ſpread abroad, ſhe was by orders of the ſupreme magiſtrates of Berne, removed to the hoſpital, and narrowly watched both by the phyſicians and thoſe about her; who all affirmed, that ſhe really eat nothing; for which reaſon ſhe was carried home again, where ſhe continued to live many years in the ſame manner.

We ſhall alſo find that an inhabitant of Cologne, ſeized with a melancholy madneſs, lived ſeven weeks on a little water every day, or every ſecond day; and that an inhabitant of Harlaem, ſeized with a raving madneſs, lived forty days on nothing but the ſmoke of tobacco, now and then rinſing his mouth with water; that a pregnant woman, the ſuperior orifice of whoſe ſtomach was ſo cloſely ſhut up, that no food, ſolid or liquid, could paſs it, lived two months together without eating or drinking any thing; that a girl through ſome family pique, paſſed eighteen days without eating or drinking, except that on the ſixteenth day, ſhe took a little cake ſteeped in water. All France had heard of the abſtinence of father Leaulté, a Benedictine monk, who for upwards of twenty years, celebrated maſs every day during the whole lent, and took no kind of nouriſhment. And all Italy has heard of a Jewiſh woman called Ricca, who, ſeized with extraordinary ſymptoms, which took their riſe from a ſuppreſſion of the menſes, and from a great lowneſs of ſpirits, paſſed upwards of ſeven months without retaining on her ſtomach either food or phyſic; nay, all endeavours to nouriſh her with clyſters made of chicken or capon broth, proved ineffectual, as ſhe could not take them in, or, when ſhe did, could not keep them. Some travellers aſſure us, that not a few of the inhabitants of the Canadian foreſts, paſs long intervals without any kind of ſolid food, contenting themſelves with water and the fumes of tobacco; and that a great number of catholicks, ſhut up in the priſons of Cochinchina, being refuſed any food, lived without it many months. I omit what Plato ſays in his tenth dialogue on the republic. "Verily, I ſhall not tell you a "ſtory of Erus, an Armenian, a brave "man of the Pamphilian family, who "having ſome time ago fallen in battle, "was ten days after, when they were taking away the other, now putrefied bodies, found without any ſigns of putrefaction; and being brought home to "receive the laſt offices, came to himſelf "the twelfth day, after they had placed "him on the funeral pile." Nor of the ſeven famous ſleepers in the time of Valentinian; nor of what is reported of Empedocles, that he uſed to make men live thirty days together without eating or drinking; nor of the Lucomori of Ruſſia, who ſleep the whole winter ſhut up in their houſes, till the return of ſpring, when they get up, and again make their appearance, for theſe are conſidered as fabulous relations, by the moſt inquiſitive writers; and, beſides, I imagine, that the few I have above cited, are ſufficient to prove, that men can live for ſome time at leaſt, without food; and for a ſtill much longer time on very little. For theſe, were there no other inſtances, whereas there are almoſt without number, would alone be ſufficient to eſtabliſh the poſſibility of what I myſelf have related concerning the women confined in the ſtable overwhelmed by the valanca; whoſe long abſtinence, however, compared with that of others, we ſhall find much more extraordinary on account of certain circumſtances that attended it. Moſt of thoſe perſons, whom we know to have lived without food, were reduced to that condition by diſorders, which prevented any food from getting into the ſtomach; or elſe the animal functions in them were ſo much obſtructed, as to put a ſtop to digeſtion, chylification, and every other of thoſe ſeparations and excretions, from whence proceeds the neceſſity of new nouriſhment. Whereas theſe three poor women were, at the time this misfortune happened them, in the beſt ſtate of health, and all their lives accuſtomed to hearty living like all other country folks, ſo that it was neceſſity alone, that hindered them from allowing their bodies the ſupport they required; it being evident, that their abſtinence from food, was not owing to want of excretion, but the much felt want of food. But we ſhall ſee preſently, that it is not in this light alone, their caſe is ſo ſingular. What really renders it ſingular to the laſt degree, is the little room, ſurrounded as they were on every ſide by ſuch ſolid ſnow, they had to breathe in for ſo long a time. I ſhall, therefore, conſider each of theſe circumſtances by itſelf, and endeavour to ſhape my reaſonings upon it, by obſervation and experiment; thinking myſelf very happy, if I ſhall be found to approach the truth, and appear no way tenacious of my own opinion; a thing which anſwers no other purpoſe, but that of involving the ſciences in darkneſs and confuſion, and of courſe, retarding the improvement of them.

One of the worſt things theſe poor women had to ſuffer in the ſtable the whole time of their confinement, was the ſenſation of cold, which pierced them to the bones, and from which they could in no ſort, defend themſelves. I ſhall not here enter into a phyſical diſcuſſion, in order to determine in what cold conſiſts, and what it is that excites in our ſouls that idea which is called cold. It is ſufficient that I obſerve, that when the direction of the ſolar rays towards our earth, is moſt oblique, and the ſtay of the ſun under our horizon, longeſt, it is then with us, the ſeaſon which is called winter, and in which cold is felt; and that when any parts of our body are touched by another leſs warm body, we ſay that ſuch leſs warm body is cold. This we may obſerve frequently to happen in ſummer, when the winds are high, and attended with hail and heavy rains. Our bodies, through the heat of the ſeaſon, uſed to a warm medium, ſurrounding and touching us in every part, ſuffer a ſenſation of cold on the leaſt abatement of that warmth; though ſuch abated warmth, compared with that of the air in winter, is very intenſe; ſo intenſe, that in winter, according to Boerhaave, no man, who had been for ſome time expoſed to the open air, could continue for any time in a room heated to ſuch abated degree, without fainting. It frequently happens, that the country people, on coming down from the very cold mountains into the plains, feel the air temperate, and even ſometimes warm, whilſt thoſe who conſtantly reſide in theſe very plains, complain of being almoſt frozen to death. For my part, theſe obſervations are ſufficient to convince me, that we call thoſe bodies cold, which, compared with other bodies, are leſs warm; though actually warm, if compared with thoſe which are leſs ſo. Philoſophers, therefore, finding by experience that as moſt bodies are put in motion, and rarefied by heat, ſo on the heat's diminiſhing, they loſe that motion, and are condenſed in proportion to ſuch diminution, took occaſion from thence to invent the thermometer; and by obſerving the rarefaction and condenſation of the liquor contained in the tube, in conſequence of which it riſes or falls, have endeavoured to meaſure and determine, or, to ſpeak more properly, indicate by means of ſuch riſing and falling, the different degrees of heat and cold. It is, indeed, true that as yet no inſtrument had been found capable of indicating exactly, at all times, the degree of heat in the human body, and that we are ſtill very far from knowing, what, really, are the cauſes which produce in us the ſenſation of cold. For we often experience in our bodies different degrees of heat and cold, the mercury of the thermometer ſtanding in all the ſame height; and this does not happen in one man only, but in many at the ſame inſtant;

as it ſometimes happens in winter, that we feel a great degree of cold, whilſt the thermometer indicates no ſuch thing; and ſometimes again we do not feel that cold, which we felt at other times, when the liquor was at the ſame height. Hence we may reaſonably conclude, that there is ſome cauſe operating on the human body capable of leſſening its heat and producing cold, whoſe action does not appear to our ſenſes by means of the glaſs of the thermometer or the fluids contained in it. It has ſometimes happened, that no alteration has been perceived in the fluid of thermometers, placed in the hands of aguiſh patients, in the cold fit, though attended with frequent yawnings, livedneſs of the lips and nails, paleneſs of the face, chattering of the teeth, a great infrequency and ſlowneſs of the pulſe, ſuch a degree of cold, in ſhort, as the phyſicians call a bone breaking cold; a moſt evident proof, that the cauſe producing cold in the body of ſuch ſick perſons has no action which the thermometer can exhibit to our ſenſes, for we cannot, on theſe occaſions obſerve the leaſt alteration in that inſtrument.

Suppoſing, then, that all theſe accounts are true, and, indeed, there is no denying the truth of them, it is certain, that, whatever the eſſence of cold may be, it muſt, according to its greater or leſs intenſeneſs and activity, unavoidably produce various and proportionably ſenſible alterations in the human body; all philoſophers, in general, allowing, that effects always bear a relation not only to the cauſes, from which they ſpring, and on which they depend, but likewiſe to the preciſe diſpoſition of the bodies, on which they operate. Among theſe diſpoſitions we may, certainly reckon that, by means of which different, bodies are differently affected by the ſame degree of cold, inſomuch that ſome ſhall experience no inconveniency when expoſed to a degree of it, by which others are terribly affected. The moſt general degree of heat the human body in a ſound ſtate, is thirty-two degrees by Reaumur's thermometer, and by Fahrenheits's ninety-two, and the temperature of the air by the firſt ten degrees, and by the ſecond fifty-two. It is a moſt ſurpriſing thing, that human bodies did not ſuffer the moſt grievous inconveniencies by the cold of 1709, which was fifteen degrees and a half under the freezing point of Reaumur's thermometer, and at the degree of ſal-ammoniac congelation by Fahrenheit's; however, that ſuch numbers were at that ſeaſon viſited by ſickneſs, and ſo many of theſe periſhed by it, can be attributed to nothing but ſuch extraordinary degree of cold. But what is ſtill more ſurpriſing, there are countries, in which men have lived, and generally live in much more intenſe cold, as may be ſeen in a learned diſſertation of Deliſle's, in which he has collected many obſervations made by himſelf and others, adjuſted to his own and to Reaumur's thermometer. In Aſtracan, in 1746, the cold was at twenty-four degrees and a half unher the freezing point of Reaumur's; at Peterſburgh, in 1749, at thirty; at Quebec, in 1743, at thirty-three; at Tornea in Lapland, where the French Academicians, who had been ſent to meaſure a degree of the meridian under the polar circle, made ſome ſtay, it fell to thirty-ſeven. Gmelin has experienced it ſtill greater, for in the preface to his firſt volume upon the plants of Siberia, he affirms, that, according to the obſervations made in all parts of that country, even the moſt ſouthern, the mercury in Deliſle's thermometer has been often at two-hundred and twenty-ſeven degrees, which amounts to almoſt fifty-five degrees and a half under the freezing point of Fahrenheit's. At Kirenga, in particular, at four in the morning of the 10th of February 1738, he ſaw it, according to Fahrenheit's thermometer, almoſt at ſeventy-two degrees; and had before ſeen it, at nine in the morning of the eleventh of December 1736, almoſt at ninety degrees under the freezing point; and at eight the morning of the 29th of the ſame month and year at more than ninety-nine; and, laſtly, the ninth of January of the following year, at more than one hundred and thirty. At Jeniſeik, at eleven in in the evening of the fifth of January 1735, he ſaw it ſunk to one hundred and twenty degrees and more under the freezing point; which deſcent of the mercury, ſays Gmelin, "Stupenda eſt, et ante nemini ne in mentem quidem unquam venit. Durante hoc Jeniſeenſi frigore picæ, et paſſeres a gelu veluti extincti in terram conciderunt, recreati, quoties poſt brevem moram in conclave tepidum inferrentur, quæ res Jeniſeenſibus incolis perquam rara viſa eſt. Fama etiam percepi, inſignem ferarum multitudinem a gelu rigentem, et mortuum in ſilvis inventam eſſe, nec paucos homines in itinere eo die verſatos a gelu ita correptos fuiſſe, ut ſucci eorum penitus rigerent, atque conglaciarentur." Now who can account for mens being able to abide ſo intenſe a degree of cold, and live, but by the great variety in the conſtitution, manner of living, and, in a word, in the diſpoſition of thoſe bodies, upon which the cold is to act. Bonetus relates of Lewis Saladine, that, at the approach of winter, he found himſelf under a neceſſity of ſhutting himſelf up in his bed-chamber, and there remain with every the leaſt flaw in the walls exactly cloſed till the return of ſpring. What Haſeneſtius relates, is ſtill more ſurprizing. He tells us of a man, who having accuſtomed himſelf to live conſtantly in warm places, in order to ſhun every, even the ſlighteſt, inconveniency, thereby became ſo delicate, and ſo ſenſible to the impreſſion of the cold air, that he could never afterwards expoſe himſelf to it, without experiencing the greateſt evils; ſo that at laſt, he ſaw himſelf obliged either to remain in bed loaded with blankets, or when he got up, wrap and fold himſelf up in thick furs, to avoid the diſagreeable ſenſation excited in others, when they put ice to their face or the back of their hands: nay, the delicacy and ſenſibility of this man were improved to ſuch a degree, that he could not endure the contact of the ſummer air, ſo that, even then, he found it requiſite to wear furs, and cover his cheeks and eye-lids. It is, therefore, evident, that the different kinds of life men lead, contribute greatly to render them more or leſs patient of cold; and that it is owing to this, that ſome put up with an intenſe degree of cold better than others; ſo that one man ſhall be chilled and frozen almoſt to death, by a degree of cold ſcarce felt by another. By all this it is evident, that is not ſo very eaſy to determine exactly what is the degree of cold, the human body can endure; as, on the other hand, it is extremely difficult to tell in what degree of heat men cannot live, ſince ſome bear heat a great deal better than others.

I juſt now ſaid, that the heat of the human body, according to the obſervations of ſome perſons, is generally at thirty-two degrees of Reaumur's thermometer, and ninety two of Fahrenheit's; which degree of heat in the circumambient air, it would be impoſſible for them to bear. On the other hand, there are many obſervations to prove, that men have lived in a much hotter air. Duntze obſerved in the apartment of his learned maſter, Holman, at Gottingen, the mercury of Fahrenheit's thermometer at ninety-five degrees on the 24th of July 1750. In South Carolina, Lining ſaw it riſe to ninety-eight degrees in the month of June 1738; and yet there died by it but two men in the ſtreets of Charles town, and ſome negroes at work in the fields; and in the ſame country the mercury roſe one hundred degrees in the month of July 1751. In Syria, likewiſe, it roſe to ninety-eight, and in Senegal to one hundred and three and a half, as Reaumur tells us in the memoirs of the Royal Academy of Sciences at Paris: and according to the moſt exact obſervations of Lerche mentioned by Gmelin, it roſe to one-hundred and three degrees and a half at Aſtracan in 1746; upon which Gmelin remarks: "Quid quod tepidariorum Ruſſicorum calor, in quo homines non unum minutum, ſed dimidiam, et integram horam morantur, in centeſimum, et octavum, quin in centeſimum, atque decimum, et ſextum gradum cogit, quæ obſervatio in omni Ruſſia quovis die repeti poteſt." It is, beſides, to be noted, that all theſe obſervations were made with thermometers placed under cover from the ſolar rays, which certainly, if they had directly ſhone on the mercury, could not have failed of driving it much higher, and indicating a ſtill greater degree of heat. Theſe obſervations put Duntze upon trying, if by many diligent experiments upon dogs he could aſcertain exactly the greateſt degree of heat theſe animals are capable of bearing. A maſtiff ſhut up in a room ſeventy-ſeven degrees hot, died in ſix hours, the heat having encreaſed in that time to one hundred and thirteen. Another dog of the ſame kind, put in a room ſeventy four degrees hot, did not hold out above four hours, the heat encreaſing to one hundred and fifteen degrees: a third, but ſmaller, put in a heat of ſeventy ſeven degrees, was dead in five hours and a half, the heat having attained one-hundred and twenty-two degrees; another ſmall dog, weighing ſix pounds, placed in a heat of one hundred and forty-ſeven degrees, died in twenty-nine minutes. Three other dogs, the firſt a brown maſtiff, the ſecond a black maſtiff, but younger and ſmaller then the firſt, and the third alſo younger, with ſky-blue ſtroaks, being all placed in the ſame room, and at the very ſame moment, when the mercury in the open air was at ſeventy-five degrees; the firſt died in a little more than three hours, when the heat of the room was encreaſed to one hundred and ſix degrees; and the third, in little more than five hours and twenty-eight minutes, when it was encreaſed to one-hundred and nineteen degrees; and the ſecond held out ſeven hours, when the heat was one-hundred and twenty-ſix degrees. To conclude, in a ſugar-houſe, whoſe heat was at one-hundred and forty-ſix degrees, a little bird died in two minutes, and a dog in twenty-eight, caſting out at the mouth a red, purulent and ſtinking ſaliva. Now nothing elſe can be reaſonably inferred from theſe experiments, than what is already advanced, namely, that it is impoſſible to determine preciſely the greateſt degree of heat in the air, in which men and animals can live; as we have demonſtrated, that it is equally impoſſible to determine exactly the preciſe degree of cold in which both muſt periſh; both depending on their conſtitution, their uſual way of life, and their bodies being more or leſs inured to ſuch impreſſions.

Now to apply what we have been ſaying to the caſe in hand, if we conſider, that our three poor women were inhabitants of

Bergemoletto, a place ſurrounded by very high mountains, in which it frequently begins to ſnow in Auguſt, and does not leave off until the end of June, and where, beſides, the ſnow lies on the ground in one place or another the whole year, it will immediately occur, that their bodies muſt have been leſs ſuſceptible of the impreſſions of the cold, than the bodies of thoſe accuſtomed to a leſs ſevere climate; and of this we may the more eaſily be perſuaded by recollecting, that a vaſt quantity of ſnow had fallen before the accident happened, ſo that they had already felt a great deal of cold, and, in a manner, inured their bodies to that ſenſation. They were, beſides, in conſequence of their laborious kind of life, of a ſtout and hale conſtitution, and of ſuch a habit of body, that, their fibres being rendered more thick and firm, the cold of the external air could not ſo ſoon make any impreſſion on their fluids contained in them, and produce that ſlowneſs of motion which great colds produce in ſome perſons. Boerhaave relates of himſelf, that going in a calaſh, in the winter of 1709, in company with a ſurgeon to ſee a woman, who had broken her legs, they were ſeized, both himſelf, the ſurgeon, and the reſt of the company with heavy, and at the ſame time ſo pleaſing a drowſineſs and deſire to ſleep, that ſleep they certainly muſt, and miſerably periſh, if, to avoid ſo great and ſo imminent a danger, they had not immediately alighted themſelves, and made the reſt of the company alight, and taken to their legs. The veins of the ſkin, when touched by the cold air, contract and become of a leſs diameter; whence it happens that the blood can no longer flow through them, and get back to the heart, with the ſame velocity and in the ſame quantity as before. It therefore, flows more plentifully into the veſſels of the brain, which are much better defended and ſecured from the impreſſion of the cold air then the reſt, as it cannot eaſily purſue its journey by the jugular veins, which are more expoſed to the cold, it ſtops and gathers in them ſuch quantity, as to preſs upon the fibres of the brain itſelf; and this compreſſure is ſometimes juſt ſufficient to produce drowſineſs and ſleep. But neither the cold, which the three women had to ſuffer in their confinement, was ſo violent, nor, in conſequence of the habit of body, and the life they led, were they liable to be attacked by ſuch grievous and ſudden diſeaſes. I ſay grievous and ſudden diſeaſes, ſuch as apoplexies, obſtinate inflammations of the internal parts, or ſuch imflammations of the external, as ſoon turn to a mortification, or in a word ſuch other diſorders; as a ſharp cold is generally apt to occaſion in human bodies. Galen, in the fifth chapter of his book, De morborum differentiis, ſays, according to the tranſlation of Renatus Carterius: " morbi vero frigidi calido oppoſiti affectus extremas partes manifeſte adeo plerumque obſidet, ut ipſæ emortuæ decidant. At hujuſmodi affectus in univerſo corpore iis oboritur, qui ſub vehementi frigore iter fecerint. Eorum enim plerique in ipſo itinere mortem obierunt; plerique etiam priuſquam domum appuliſſent, diverſorium aſſecuti ſemi-mortui et congelidi ſub conſpectum veniunt. Talis affectus apoplecticis, epilepticis, tremulis, et convulſis multoties accidit. Porro eorum, qui per iter frigore mortem occubuerunt, alii emproſthotono, alii opiſthotono, alii tetano, alii congelatione vocata correpti obriguerunt, alii quid appoplexiæ ſimile perpeſſi ſunt." A ſervant travelling behind a gentleman's coach, in very cold weather, fell off, and was found by his maſter buried under the ſnow, on his return back with the other ſervants. Some days after the maſter ſent a cart to bring him to be buried: but contrary to all appearance, and to the great ſurpriſe of the by-ſtanders, on taking him from off the cart, they found him alive; the ſhaking of the carriage having put into motion his blood, arreſted and rendered almoſt ſtagnant by the cold, and thus removed the cauſe from whence his apoplexy proceeded. In northern countries,

tries, and in paſſing over high mountains, it ſometimes happens, that people overtaken by a vehement cold, are in a manner ſuddenly ſtruck dead by it; and on opening the bodies of thoſe who have periſhed in this manner, nothing amiſs could be obſerved, except a great accumulation of blood and ſerum in the ventricles of the brain, occaſioned by the burſting of the blood, or lymphatic veſſels. We read, that two thouſand ſoldiers of Charles XII of Sweden, periſhed by the great cold of 1709, and remained ſtiff like ſo many ſtatues. During the laſt war, the troops in their paſſage over the mountains of Savoy and the county of Nice, were often obliged to alight from their horſes, and purſue their march on foot, on account of the exceſſive numbneſs and ſtiffneſs, which in conſequence of the cold they felt in their legs. We are told in the voyages of Martens and of Wood, that ſome Engliſhmen, who wintered in Greenland, had their bodies for a time covered with ulcers and veſicles.

I ſhall not at preſent undertake to exhibit all the effects, which cold is capable of cauſing in human bodies, and the manner in which it cauſes them: for, example, what is obſerved in the ſurface of that part of the body, on which the impreſſion is immediately made, as on the hands, feet, noſe, and ears, ſome of which external parts become livid, others pale, others rough and uneven, others leſs ſenſible and ſupple, and therefore leſs capable of being uſed; or, what we know to happen in the internal parts, in which, in conſequence of the abatement of motion, the humours ſtagnate, inflammations enſue, the veſſels burſt, ſo that the fluids iſſuing from them, and gathering in places, where nature did not intend they ought, compreſs the adjacent parts, and impede their neceſſary functions. Theſe things I ſhall paſs by in ſilence, becauſe the cold in the ſtable buried under the ſnow, did not amount to ſuch a degree, as to make the women confined in it ſuffer ſo much. The reaſon of the cold's appearing ſo very ſharp to them, was becauſe that the abſolute heat of their own bodies leſſened conſiderably, whilſt the cold of the circumambient air continued the ſame; ſo that they could not but feel it. This abſolute heat aroſe from the motion of the blood veſſels, the oſcillation of the fibres, the action of the muſcles, the ſtock of the blood-globules, both againſt the veſſels in which they moved, and againſt each other, from the impellent forces, and from the reſiſtance theſe forces had to conquer: all which being much abated, the abſolute heat could not but proportionably abate; whence the action of the muſcles neceſſary for life being deſtroyed, the muſcles might be ſaid to be at reſt. There was wanting, therefore, one of the cauſes of the motion of the circular and inteſtine blood. They took but very little nouriſhment, ſo that the quantity of new blood generated in them was exceeding ſmall, and conſequently the velocity with which it was driven through all the channels leſs, and leſs the friction and contraction it underwent in them. Nor does it hence neceſſarily follow, that upon the removal of the cauſe reſiſting the impreſſion of the external air, which continued almoſt in the ſame ſtate, they ſhould have more ſenſibly felt ſuch impreſſions, and experienced a greater degree of cold. We may obſerve, that we often feel in very foggy weather, the cold more ſenſibly, than in ſerene weather, though in the latter, the thermometer is lower than in the former. For which reaſon, if we conſider, that the air of the ſtable in conſequence of the perpetual dropping of the water, in proportion as the ſnow melted, and the excretions of the women themſelves, as well as of the animals confined with them, muſt have been extremely moiſt, we may diſcover another reaſon why the cold ſeemed greater to them, and they muſt, therefore, have ſuffered ſome inconveniences from it, though not equally grievous with thoſe it has often occaſioned, or ſufficient to bring on immediate death. In fact, Mary Anne, beſides her being ſo poſted as not to be able to ſtir in any ſhape, and worſe off then Anne, and much worſe off then Margaret, who yet could ſcarce ſtand upon their legs, had her thighs and legs œdematous, and her knees and feet little leſs then inflexible; which diſorder, though we may in part attribute to the conſtancy of their poſture in the manger, muſt, if the facts already related be true, have been more owing to the moiſt cold with which they were ſurrounded.

But if this moiſt cold could not deprive them of life, neither could the ſmallneſs of the quantity of nouriſhment, with which they were obliged for ſo long a time to put up. This no doubt contributed very much to their leanneſs, to their weakneſs, and to the violent pains they ſuffered in the ſtomach every time they eat or drank, for ſome days after they were taken out: but it was ſufficient to keep them alive. I have already related many facts, from which it may be gathered that food is in ſome caſes not abſolutely neceſſary to the ſupport of animal life. To theſe might be added many inſtances in man and beaſt. We read of a cat, which being inadvertently ſhut up in a place, in which not ſo much as a mouſe could penetrate, was found alive after thirty one days, almoſt bald, and extremely emaciated. Redi writes, that a large lizard a cubit, and two thirds long, which he had received in the year 1669 from the coaſt of Africa, lived in Florence upwards of eight months, ſhut up in an iron cage without meat or drink. But whether it died of hunger, or of cold, or of confinement, or ſome other cauſe, he could not take upon him to affirm. This learned phyſician, in order to know what grounds there were for Borelli's ſuſpicion that ſome animals can live upon gravelly earth, and that birds pick up ſmall ſtones, by way of food, made the following trials, which I ſhall relate in his own words. "In fact,

" I may affirm that I have convinced my-
" ſelf that theſe ſmall ſtones taken in by
" birds, contribute nothing to their ſup-
" port : upon ſhutting up a capon in winter
" without meat or drink, it died in five days ;
" and other capons ſhut up in like manner,
" without meat or drink live but ſeven,
" eight, or nine days ; and on opening their
" gizzards I found in them a conſiderable
" quantity of ſtones, ſwallowed before
" they had been ſhut up, and which in all
" their time of faſting were not conſumed
" or converted into nouriſhment. I re-
" peated the experiment on another ca-
" pon, whom I conſtantly ſupplied with
" water, and with a great number of
" ſtones, which I firſt counted, that by
" way of food, he might have, if he
" pleaſed, his fill of them ; but he never
" touched them, though in the firſt
" days of his confinement he drank rave-
" nouſly and frequently. Four days be-
" fore he died, he abated gradually of
" his drinking, and at length died on the

" twentieth day: another capon confined " in the ſame coop, with the liberty of " drinking, lived twenty-four days. After " their death I found in their gizzards " ſtones, as I had found in the firſt; I " likewiſe found ſtones in the gizzards " of ſome large wild pidgeons, who having " lived without eating or drinking " ſome twelve, and ſome thirteen whole " days, died at laſt. A royal eagle held " out twenty-eight days, in the dog-days, " without eating. A vulture held " out in like manner twenty-one; a " buzzard, eighteen: and yet the eagle, " vulture, buzzard, and ſuch other " birds of prey, are not fond of ſtones, " no more than many other birds, " whoſe gizzards are not braced up with " thoſe large and ſtrong muſcles, which " we ſee in the gizzards of capons, pheaſants, " geeſe, ducks, ſwans, cranes, and " other birds, accuſtomed to peck up " ſtones. Animals do not die for want of " food ſo ſoon as common people are

" apt to believe. Of three dogs, whom
" I have killed by hunger, ſome
" held out without meat or drink thirty-
" four and thirty-ſeven days. A very
" ſmall dog, in the hotteſt days of ſum-
" mer, lived twenty-five days without
" eating or drinking; and would have
" held out much longer, if, ſpurred by
" hunger, he had not leapt out of a very
" high window. A civet-cat called by
" Caſtello Meſſineſee an odoriferous hyæna
" took up ten days to die, and a large
" wild cat twenty. A muſk-roe held out
" twenty days. A badger in winter held
" out a whole month. Rats both wild
" and tame, are very impatient of hunger;
" for in the many trials I have made on
" them, I could never get them to live
" three whole days without food. On the
" contrary, land tortoiſes have held out
" eighteen months, vipers ten; and as I
" have already ſaid, an African lizard
" more than eight, without ever deſiring
" to touch any kind of food. But it is

“ the nature of theſe three laſt animals “ to take no food at all, or very little, “ and very ſeldom, in winter. In other “ animals their ſtrength and age is of “ great ſervice to make them endure hunger a long time. But in many kinds of “ inſects it is likewiſe nature. It is ſurpriſing how clean and beautiful we find “ the inteſtines of animals killed with “ hunger; which ought to be a leſſon, “ that a regular diet is the ſafeſt remedy “ to reſtore the viſcera of the human body, “ and ſcour its moſt winding and intricate “ channels.” Van der Wiel ſays, he heard from Craanen, that a very fat large dog having been accidentally ſhut up in a room in a country houſe, was found alive on his maſter returning to it, thirty-one days after, though very weak indeed, and emaciated; having paſt the whole time, without eating or drinking any thing except a mouſe or two, ſuppoſing that mice are to be met with in lonely places, where they can find nothing to live on. We read in Mendoza, that a hen lived eighty days without meat or drink. Gaſpar Reies, in his fifty-eighth queſtion, in which he examines if a man may naturally live a long while without any meat or drink, gives us ſeveral inſtances of people who have lived without drinking, and many of people who have held out a long time without eating. The moſt remarkable of theſe inſtances, is that of a Spaniſh woman, who lived ſeventy-two days in a cave, without having in all that time any thing to ſubſiſt on, as ſhe afterwards affirmed upon oath, except a little rain water, ſucked from her head-clothes, and which ſhe now and then ſteeped into it. We meet with many more inſtances, in the ſecond century of uncommon caſes of the above-mentioned Van der Wiel, printed at Leyden in 1727. Four men, working in a coal-pit, near Liege, and happening to ſtrike upon a very plentiful vein of water, were by its iſſuing in great abundance upon them, obliged to retire to the higheſt, but inmoſt part of the mine, where they remained twenty-four days, ſubſiſting entirely on the water trickling from an adjacent ſpring. It is known, how uſual it is with the phyſicians of Naples to recover patients by not permitting them to ſwallow any thing but ſimple ſnow water, with which they make them hold out thirty-days, and even longer. A Sicilian capuchin and Hanchok have cured more diſorders than one in this manner. In the year 1755, I attended for two months a phthiſical patient in St. John's hoſpital, allowing him every day but three pounds of barley water, and ſix ounces of cow's milk morning and evening; in the ſame manner I cured another in the year 1756; and they are now both of them alive and well. The reader, I think, cannot but conclude from all theſe experiments and obſervations, that men to live require very little nouriſhment, and that in certain circumſtances they may live for ſome time without any at all. Now, as, ſuppoſing the facts to be true, it is proper, by comparing them with others, to endeavour to account for them the beſt we can, if not by evident, at leaſt by probable cauſes, and thereby approach as near as poſſible, the beautiful face of truth; ſo, availing ourſelves of what has been moſt learnedly obſerved and advanced by others upon this head, we ſhall endeavour to ſhew, that the little ſnow water and milk taken by Mary Anne, Anne and Margaret, were ſufficient to keep them alive.

In the year 1750, Paul Combaluſier, propoſed the following queſtion in the medical ſchools of Paris. "Can a man live "in good health, for a long time, without eating or drinking?" And after a rigorous diſcuſſion of every argument that could be allowed on the occaſion, he concludes, that a man may live a long time, but not in good health, without eating or drinking. The learned academicians of Bologna, being aſked their opinion by Benedict XIV. of happy memory, while a cardinal,

dinal, concerning the two following points: the firſt, if a man by the mere ſtrength of nature, can live for months and years together, without taking any kind of liquid or ſolid nouriſhment; the ſecond, if the opinions of Licetus, Reies, and Zacchia, affirming, that he may really live in that manner, and accounting for it by the maxims of the antient phyſicians, are ſolid or not, when compared with thoſe of the moderns; the learned Academicians, I ſay, anſwered one, and the other by an excellent diſſertation intitled, *De Longis Jejuniis.* For this treatiſe, we are chiefly indebted to the late Matthew Bazani, and Giacomo Bartolommeo Beccari; of whom the learned and holy father makes honourable mention in the following words in his treatiſe: "De ſervorum Dei beatificatione, et beatorum canoniſatione, Part 1. lib. 2. c. 27. Præ ceteris academicis Jacobus Bartholomaeus Beccarius medicus clarus, et Matthæus Bazanus, philoſophus doctus, medicus probatus, anatomicus non vulgaris, et undeque dequaque diſertus in concinnanda diſſertatione laborarunt." In this diſſertation, they prove, firſt, by many obſervations on the bodies of men and beaſts, that the latter can live a long ſpace of time without taking any kind of food; and by ſure and certain accounts, that many perſons have actually done ſo. ſecondly, they confirm this their doctrine taken from the ancients, by the phyſiology of the moderns. Let us now, then, ſee what are the grounds of the opinion, that man can live a long time without food; and apply them to the three women in queſtion.

Whoever conſiders with the leaſt attention the component parts, and the operations of the human body, muſt allow that they conſiſt entirely of channels, of humours that run in theſe channels. Theſe conſiſt of ſolid parts, which put in motion, are the principal cauſe of the perpetual circulation of the fluids. The life of man, therefore, conſiſts in the action and re-action of theſe ſolid and fluid parts, which cannot but move reciprocally, and reſiſt each other. The fluids driven into the channels of the human body, cannot but dilate them, and theſe veſſels forced out of their natural ſtate, cannot but endeavour to return to it, and in ſo doing, compreſs and drive forward the contained fluids; as we ſee happen in the blood, which driven by the heart into the arteries, is by theſe puſhed into the veins, from whence it flows back again to the heart. This perpetual motion of both fluids and ſolids, renders the humours more fluid and ſubtle, produces the ſecretions and excretions, and a violent friction againſt the ſides of the veſſels, from which, of courſe, ſome particles muſt ſeparate, eſpecially at the extremities of the conic veſſels, in which this friction is exceedingly great, the ſides being there touched by almoſt every globule of the fluids that paſſes them. From all, fly off ſome very ſubtle, moveable, active particles, by ſome called fire, by others æther, by others again, electrical matter, from whence ariſes that heat which diffuſes itſelf all over the body. Now what muſt be the conſequence of this continual action and re-action, but that the channel coming to be gradually worn away and conſumed, by the conſtant flow of the humours through them, and the humours themſelves to be diſperſed and diſſipated by continual exhalation, the human body ſhould in courſe of time be deſtroyed, if the remaining humours were not as conſtantly recruited by new humours, and the channels repaired by an acceſſion of new particles, inſtead of thoſe carried off by the humours. Now this can only be effected by the taking in of ſome ſubſtance capable of yielding chyle, which mixing with the blood, may enable it to repair all the loſſes occaſioned by continual motion. Wherefore, were it not for the exhalation of the humours, and the abraſion of the channels, both might continue to play and move, without the acceſſion of any foreign matter, and men, of courſe, to live without the aſſiſtance of food. Furthermore, could the humours, notwithſtanding the perpetual action and re-action of the fluids and ſolids, continue in their natural ſtate, and not ſpoil, man might not only live without food, but enjoy good health. Hence it is, that, according to the difference in point of climate, ſeaſon, age, conſtitution, habit, and way of life, we ſee ſome perſons require a greater, and others leſs quantity of food; the channels in ſome, continuing for a long time ſoft and ſupple, and the humours ſweet and mild; whilſt in others, the ſolid parts ſoon grow ſtiff and hard, and the fluids, ſour and corroſive. Thoſe who live in a thick heavy air, can better bear remaining for ſome time without any food, than thoſe who live in a thin light air. In ſummer-time, on account of the increaſed motion of the blood, and exhalation of the humours, we ſhould eat and drink more frequently, in order to replace the particles of the body which fly off in that ſeaſon, more than in winter, in which we perſpire leſs, and loſe leſs by the pores of the ſkin, which are greatly contracted by cold. Youths and boys, generally ſpeaking, (what I ſay in general, in regard to different ſeaſons, and different ages, is to be underſtood of different conſtitutions, and all the other differences I have mentioned) youths and boys, I ſay, generally ſpeaking, are obliged to eat and drink much oftener, and in much greater quantity than grown up people, as well as perſons far advanced in years, and ſuffer much more by the want of nouriſhment. " Inediam (Celſus obſerves) facillime ſuſtinent mediæ ætates, minus juvenes, minime pueri et ſenectute confecti." Such bodies as have ſoft, and not very elaſtic fibres, and abound in humours, do not ſtand ſo much in need of frequent nouriſhment, as thoſe whoſe fibres are ſtronger and more elaſtic, which drive on the humours with more violence, and attenuate them to a greater degree, ſo as to render the diſperſion of them more copious. It is for this reaſon, that women can much longer do without food than men. Every one knows the force of cuſtom, which phyſicians call a ſecond nature, and to which the greateſt regard and attention is to be had in the cure of diſorders; it being certain, that thoſe things to which we are not accuſtomed, do us more miſchief than thoſe to which we are; though the former are in themſelves more wholeſome than the latter, and more ſuitable to our nature. He who has uſed himſelf to live upon little, may hold out without that little, ſome time longer than a perſon uſed to eat more. Pechlin gives us an account of a tapeſtry weaver, who took no food but twice a week, without receiving any hurt from ſo long an abſtinence. Thoſe who have accuſtomed themſelves to very little food, do not miſs that little, if they chuſe to do without it. To conclude, we obſerve that perſons of a ſedentary and delicate way of life, ſuch as do not too much fatigue either body or mind, and who live on very ſucculent and nouriſhing things, can bear being longer without any food, than country labourers, artizans, and ſuch people who ſpend the whole day in bodily exerciſes, and uſe a coarſer and leſs chiliferous diet. "Ubi fames, minime laborandum eſt," ſays Hippocrates: and Celſus; "Si quibus de cauſis futura inedia eſt, labor omnis vitandus eſt." It is obſervable, that thoſe who ſleep a great deal, are not apt to have good appetites; and that, on the contrary, thoſe who ſleep little, require a proportionably greater quantity of food. That great philoſopher Bacon, affirms: "Animantia ſomno plurimum indulgere ſolita, modico victitare, ut glires, veſpertiliones." We have in Reaumur's memoirs of inſects, a very curious obſervation communicated to him by Varignon. Varignon had a dormouſe, who uſed to ſleep ſo ſoundly in winter, that nothing leſs than the heat of a lighted candle could awaken him, relapſing into his profound ſleep as ſoon as the ſmart, occaſioned by the candle was over. One Chilton, as we are told in the philoſophical tranſactions, uſed to ſleep for ſeveral weeks together, and though he ſometimes, during theſe fits, eat and drank in a ſtrange and unuſual way; at other times, he either took no ſuſtenance, or took it very ſparingly. William Foxley, a potter, as Wiel has related out of the annals of England, in the reign of Henry VIII. was ſeized, without any previous diſtemper, with ſo heavy a ſleep, that he ſhewed no appearance of waking fourteen days and fifteen nights together; and when he at laſt awoke on the fifteen day, he awoke in perfect health, and in ſo firm a belief, that he had ſlept but one night, that nothing but the building of a neighbouring wall could convince him of the contrary. It being therefore plain, from what has been ſaid, that the action and re-action of the humours and channels of the human body, may be ſo abated, as that it ſhall not decay by little nouriſhment; we may, I fancy, the more eaſily conceive, on examining into the condition of the three women buried under the valanca, how with the little ſnow they uſed to put into their mouths, and the little milk their friendly goats ſupplied them with, they might have held out, though with difficulty and detriment to their health.

The chief things which oblige men to eat and drink, are motion, exerciſe, and fatigue, which increaſes the attenuation and diſperſion of the fluids, the abraſion of the channels, and that heat which diffuſes itſelf over the whole body, and which, at the ſame time that it is neceſſary for the preſervation of the human body, tends to deſtroy it, not only by greatly diminiſhing, condenſing, and ſouring the remaining fluids, but likewiſe by encreaſing the rigidity of the ſolids. From the three women continuing conſtantly motionleſs in the ſame poſture, we may conclude, that their humours muſt have moved with far leſs velocity than uſual; that the abraſion of the ſides of the channels, muſt have been far leſs; that the heat of their bodies, and, of courſe, the attenuation and evaporation of their humours, muſt have greatly abated, ſo as conſiderably to leſſen the neceſſity of taking any nouriſhment to repair the loſſes ſuſtained by channels and humours. Where there is no waſte, there can be no neceſſity for repairs. Beſides, ſome are of opinion, that in caſes where no new ſuſtenance can be taken, great help is derived from the humours which have not as yet been thoroughly digeſted, of which there conſtantly remains ſome portion, particularly the fat, to ſupply the place of what is loſt; though the obſervations made upon frogs and bears, which come fair and fat out of their holes and dens, leave ſome room to doubt, whether in thoſe animals, which paſs the winter motionleſs, and almoſt conſtantly aſleep, the fat is intended to yield them any great ſupport. Be that as it will, the ſeparations and excretions, which are conſtantly going forward, require that the body ſhould take ſome new nouriſhment. Now theſe functions were remarkably diminiſhed in the three women, and ſome of them, eſpecially in Mary Anne, totally ſuppreſſed. There, therefore ceaſed in them another cauſe of our taking nouriſhment, ſo that the little ſnow and milk they now and then took, might very well repair the ſmall waſte their bodies ſuffered.

Hence it appears, that the moſt wonderful part of theſe womens ſtory, is not the great cold they endured, nor yet the ſmall quantity of nouriſhment they were obliged to put up with. The moſt ſurpriſing circumſtance of it, in my opinion, is their not having immediately periſhed for want of air, as what they had, could not, at firſt ſight, but ſoon loſe, by breathing it ſo often, its power to extend and work their lungs. By the havock the valanca made, as well as by the ſpace it occupied, it is evident that the ſnow, under which they lay in the almoſt ruined ſtable, muſt have been very high and thick. It was, in fact, as I have already ſaid, forty-two ſeet high. The ſpace found free, when they were dug out, was ſix feet long, ſour broad, and two and a half high. It is true, that in the beginning, this ſpace might have been larger, but it grew leſs and leſs from day to day, through the ſettling and greater condenſation of the ſnow. Beſides, this priſon contained two goats, who could no more live than the women without a ſupply of freſh air, and from whom too, there muſt have eſcaped by inſenſible perſpiration, ſome very ſmall particles, though perhaps in no great plenty. Beſides, there could not but ariſe many effluvia from the dead bodies of the boy, the aſs, and the hens, which along with thoſe from the excrements of the women and the goats, could not but render the air of the ſtable unhealthy, and ill qualified to favour the indiſpenſably requiſite buſineſs of reſpiration. Who does not know, that the air of priſons, into which numbers are crowded, is greatly infected by the conſtant exhalation from their bodies, which have ſo few and ſmall openings to eſcape at. Much worſe ſtill is the air of hoſpitals, on account of the great quantity of unwholeſome effluvia exhaled by the ſick, and their continually breathing their own breath; the ſmell felt on entering, being ſuch, that to characterize any bad ſmell, we call it an hoſpital ſtench. What bad effects ſuch air is apt to have, thoſe can tell who ſerve and attend the ſick, and pay ſo little regard to their own health and that of the patients, as to take no care to mend it. It is for this reaſon, that following the uſeful and laudable inſtructions, given in our univerſity, and in the hoſpital of my moſt learned and friendly maſter doctor Badia, phyſician to his majeſty, I have given orders, that in the hoſpital of St. John, (whatever the incurables, who know not their own goods, may think of it) every morning, even in winter, the windows ſhould be thrown up, and left open in that ward where it is my lot to attend, by which means, the poiſonous vapours accumulated in the night time, are driven out and diſperſed, and new air, fitter for reſpiration, introduced, to the great advantage of the ſick, my ſcholars, and myſelf. What we thus ſee in hoſpitals, we may obſerve in proportion in private houſes, whoſe inhabitants ſometimes experience, to their unſpeakable detriment, how unwholeſome it is to keep the curtains of the ſick man's bed always ſhut, the rooms too cloſe and warm, and the ſick themſelves, loaded with blankets; as is the cuſtom of ſome, eſpecially in the ſmall-pox, and in many fevers, which it is too uſual to conſider as miliary fevers. "Vidi ego", ſays Huxham, "Multoties anxietates, et languores febriles momento fere depulſos, feneſtris

tantum apertis, quibus imprudens nutricula ſpiritibus, uti dicitur, volatilibus perperam omnino mederi ſatagit; immo tunc adeo non juvant cardiaca calidiora, ut etiam maxime noceant: longe enim melius reſpiratione auræ frigidæ, et miſſione nonnunquam ſanguinis abiguntur: quia ortum habent ſæpiſſime a congeſtione, et nimia ſanguinis rarefactione in pulmonibus." Thoſe too, who work in deep and cloſe places, experience the fatal conſequences of breathing the air generally contained in ſuch ſituations. The precautions taken by ſextons and the like, to keep the graves open for ſome time before they go down into them, ſhews that they know that the air pent up in thoſe places, is very pernicious. Cuſtom, I muſt own, is very powerful in theſe caſes; for the Europeans who go to certain parts of America, ſuffer much more in the beginning from the climate, than they do when they have been for ſome time accuſtomed to it.

In Boyle's "Nova Experimenta pneumatica reſpirationem ſpectantia," we have an account of four experiments, made by him, on a mouſe, to ſhew how powerful uſe is, in qualifying animals to live in an air deprived of its elaſticity, and thereby rendered in a manner unfit for reſpiration. He put a little mouſe into a round wide necked bottle, containing eight ounces of water, with a bladder, void of air, tied over it. Then placing the bottle under a middle ſized receiver, to which was fitted an exact barometer, he began to extract the air, till he judged he left behind but one fourth part of what the receiver originally contained. The bladder, upon this, ſwelled with the air rarefied in the bottle to ſuch a degree, as to appear about half full, and the mouſe, panting, endeavoured, to eſcape by the mouth of the bottle. Fearing, therefore, it might die, he let new air into the receiver, upon which the bladder immediately ſubſided to its priſtine ſtate, and the mouſe recovered itſelf. Having let it reſt a little, he again exhauſted the air to the ſame degree as at firſt, notwithſtanding which, the mouſe made no attempt to get out of the bottle for four minutes; but at the end of this ſhort ſpace, it ſeemed to be ill again, and therefore Mr. Boyle, once more, let new air into the receiver. The mouſe, upon this, recovered a ſecond time, but with great difficulty, trembling all over, and for a long while unable to ſtand. Willing, however, to make ſome further experiments on the creature, Mr. Boyle again placed it in the ſame manner under the receiver, and after he had extracted the air to the ſame degree as in the proceeding experiments, which appeared by the barometer and the ſwelling of the bladder, the mouſe continued a whole quarter of an hour without any apparent danger of dying. The accurate Engliſhman even obſerved,

that

that when in this experiment the creature was put all trembling under the receiver, the trembling went off, though the air had been almoſt intirely exhauſted out of the receiver, and of courſe the decanter; that it did not tremble again, but returned to itſelf much ſooner when the bottle was taken out of the receiver. To conclude, he placed the mouſe for the fourth time and in the ſame manner under the receiver, and exhauſting the air, till the mercury had ſunk half an inch lower than in any of the preceeding experiments, the mouſe appeared a little affected by it in the beginning, but ſoon grew quiet again, and remained ſo for a quarter of an hour; at the end of which, Mr. Boyle being deſirous of ſeeing what effect a greater rarefaction of the air might have on it, he began to work the pump once more, and made three ſtrokes before the creature ſhewed any ſigns of being in imminent danger of death. As ſoon as it did, he let in new air, on which the little creature took breath and recovered again much ſooner than he could expect. The moſt ſingular circumſtance of theſe experiments, in making of which Mr. Boyle does not tell us what time he employed, is that he never took the bladder from off the mouth of the bottle, ſo that the creature muſt the whole while have breathed the ſame air. After all, Boyle in the concluſion ſays, that though he lays no ſmall ſtreſs on theſe experiments, he is, notwithſtanding, obliged candidly to own, in conſequence of one or two afterwards made by him, that to affirm any thing poſitively concerning animals being able to accuſtom themſelves to breathe ſuch air, the ſame experiments ſhould be made again and again, and on different kinds of animals. On the other hand, Deſaguliers has likewiſe obſerved, that ſome kinds of animals reduced by certain pernicious vapours to the laſt gaſp, and then recovered, ſuffer leſs from theſe vapours if expoſed to them a ſecond time, nay, ſometimes ſuffer nothing from them at all.

Many and very different are the opinions of phyſiologiſts concerning that property of the air in conſequence of which, when frequently breathed, it gradually loſes its wholeſomeneſs, and its power to dilate the lungs to the degree requiſite for the ſupport of life. Some have believed, that, among the great number of particles of different kinds contained in the circumambient air, which we alternately draw in and throw out again, there are ſome, which, reabſorbed or reimbibed by the humours through the external ſurface of the body, or inſinuating themſelves into the blood itſelf by means of the lungs, are very fit to nouriſh the body. Nay, ſome look upon theſe particles to be ſo neceſſary in this reſpect, as to attribute the death of animals ſhut up in places having no communication with the external air, to nothing elſe but the total conſumption of ſuch particles in the air contained in the body, and the want of a new ſupply. Others have thought, that, in theſe caſes, the death of the animals is owing to the exhalations of their own bodies, which, not being carried off by an acceſſion of freſh air, continue to ſurround them, and acquire ſo pernicious a quality, as when taken in again to occaſion death. Some, to conclude, do not attribute the death of thoſe animals either to the failure of nutritious particles in the air, or to the poiſonous quality of the ſtagnant exhalations, but to the air's loſing that determinate degree of elaſticity requiſite to expand the veſicles of the lungs, not only in conſequence of its paſſing and re-paſſing ſo often through theſe organs, but likewiſe by the accumulated effluvia of the bodies themſelves.

From theſe three principal opinions, one may, I think, reaſonably conclude, that when many animals are too cloſely ſhut up in the ſame place to have any communication with the external air, they muſt die much ſooner, than a ſingle animal in the ſame circumſtances. This conſequence, however, is not reliſhed by the learned doctor Piſtorini, who in contradiction to all the three opinions, affirms, that having ſhut up two birds in a place that had no communication with the open air, he ſaw them die in the ſame time, in which two others of the ſame age and kind died in different places. Great difficulties, no doubt, ariſe from theſe experiments againſt the three foregoing opinions. Of this, among others, was aware doctor Verrati, who willing to ſee if the thing really happened as Piſtorini had related it, made ſome new experiments with very great exactneſs; carefully noting the height of the mercury in the barometer, the degrees of heat indicated by the thermometer, and the capacity of the veſſels, in which he ſhut up the animals he made his experiments on. The veſſel he made uſe of in his firſt experiments contained two-hundred and ſixty-five cubic inches of air, Paris meaſure. He began by a pigeon, which of theſe two-hundred and ſixty-five cubic inches took up ten, ſo that there remained for the air two-hundred and fifty-five. The height of the mercury in the barometer, was twenty-ſeven inches and nine lines, and in Reaumur's thermometer about twenty-three degrees above the freezing point. Having put the pigeon in the veſſel, and placed the latter with its mouth downwards on a ſmooth and level plate of metal, that the brim might lie the cloſer to the plate, he luted it all round ſo well, that no air could poſſibly get in. In leſs then half an hour the pigeon began to breathe hard and quick, and, this hardneſs and quickneſs encreaſing by degrees, it died in an hour and three quarters. The day following he took two other pigeons of the ſame age, and, as well as he could gueſs, of the ſame ſtrenght, and placed them in the ſame veſſel he had done the firſt, on the ſame plate, and luted it all round in the ſame manner, with the degree of heat and denſity of air likewiſe the ſame. One died in an hour and thirty-five minutes, and the other ſeven minutes after, that is to ſay in an hour and forty-two minutes. By theſe experiments it appeared to Veratti, that two animals ſhut up in the ſame place, and breathing the ſame air die much ſooner than one. However, not ſatisfied with theſe experiments on pigeons, he repeated them on other animals, adapting, in them, the veſſel to the barometer in ſuch ſort, that no alteration in the height of the mercury could be attributed to any thing, but an alteration in the denſity of the air; breathed by the animals. He put a marten into a veſſel, containing about forty cubic inches of air; the mercury of the barometer ſtanding at twenty-ſeven inches and eight lines, and that of the thermometer twenty degrees above the freezing point: in a quarter of an hour, the mercury in the barometer ſunk three lines, and the bird began to breathe hard. It ſunk two lines more in the ſecond, and three in the third quarter of an hour. In the following half hour it ſunk four lines more, the marten declining faſt, till it died, which was five minutes after, when the mercury had ſunk a line and a half lower. Thus then the marten lived an hour and twenty minutes, in which time the mercury in the barometer ſunk an inch and half a line. He then put two martens together into the ſame veſſel, upon which the mercury ſunk in the firſt quarter of an hour five lines; in the ſecond, three, and in the third but two lines; by which time both the birds were dead; one dying in half an hour, and ten minutes, and the other at the end of three quarters of an hour, when the mercury was fallen ten lines. He next put three martens into the ſame veſſel, one of which died in half an hour; the ſecond in thirty-two minutes, and the third in thirty-five; the mercury in the barometer ſinking eight lines in the firſt quarter of an hour, three in the ſecond, and one line in the five laſt minutes, in all one inch. He made the ſame experiments on ſparrows, and ſmall quails; and conſtantly found that one of theſe birds always held out longer than two, and two longer than three. The ſymptoms were nearly the ſame in all theſe birds; a frequent, weak and difficult reſpiration in the beginning; then frequent and ſtrong; and when they were near their end, ſtrong, but a great deal leſs frequent. On opening their little bodies, he could diſcover nothing amiſs, except that the lungs were very red, full of blood, and floated in water (a thing not obſerved by others, who have tried whether the lungs of birds, that have died in vacuo, ſwim or ſink in water, for they always found them to ſink) and yet neither hard nor conſiſtent; as they are ſometimes found in perſons who die of inflammations in theſe organs, which I have often ſeen go to the bottom in the courſe of my anatomical obſervations on the bodies of hoſpital patients, that happened to die of that diſorder. To conclude Veratti reſolved to try, if what he had obſerved in birds, would hold good in frogs; but he found it was very far from doing ſo. A frog put into a veſſel containing forty-eight cubic inches of air, lived almoſt three whole days. Of two frogs placed together in the ſame veſſel, one lived five days, and the other eight; and of four, one died the fifth day, and the other three the eighth. The frog, therefore, is the only animal, in which Veratti experienced, what Piſtorini ſays he obſerved in birds; that is, frogs do not die the ſooner for being confined more than one at a time in the ſame place, not communicating with the external air. For this reaſon, Veratti has wiſely contented himſelf with concluding that nothing more can be reaſonably inferred from the event of theſe experiments, than that live animals confined to a place not communicating with the external air, cauſe a diminution in the elaſticity of the air left them, and cannot live long in it, whatever may be the occaſion of their death.

Now, to return to our own caſe, it is evident from all the foregoing experiments, that the air of the ſtable, in which the three women were ſo long buried, muſt have loſt its elaſticity, ſo as to be no longer fit for reſpiration, had it not ſome communication with the external air, or recovered its loſt elaſticity by ſome other means. It is a common notion

tion, that air penetrates every where; but whether or no it could make its way through a heap of ſnow forty-two feet high, of ſnow rolled down from a high and ſteep mountain, and encreaſed and accumulated to ſuch a degree as to overwhelm ſo many houſes: whether or no, I ſay, air could make its way through ſuch a heap of ſnow, and of ſuch ſnow, and make its way in a ſufficient quantity to enable the air of the ſtable to dilate the lungs of the women enough for them to live, is a queſtion I by no means intend to decide: for I think, that from ſome experiments made laſt year and repeated this, I can point out in what manner the ſtable might have been ſupplied with new air. The reader may remember, that theſe women uſed from time to time to melt ſome ſnow in order to drink it, and beſides, ſwallow ſome of it unmelted. He may likewiſe remember, that from the ill-joined and crazy roof there conſtantly diſtilled ſo much water, that in ſpite of all they could do, their clothes were in a manner rotted by it. Now, this water could be no other than that of the ſuperincumbent ſnow which was continually melting, and in melting continually diſcharged a quantity of freſh untainted air, capable of mixing with that of the ſtable, ſo as to ſerve for the reſpiration of the women and the goats. Wherefore, in order to ſee if there is a greater quantity of air in ſnow than in the water produced by it, I made the following experiments, in company with that able naturaliſt and mathematician, Aleſſandro Vittorio d'Antoni, major of the regiment of artillery, and director of the royal military ſchools.

I took two large glaſs bottles of the ſame ſize with long and wide necks, like that expreſſed table II. fig. 1. and filled them both brimful with ſnow fallen that morning; with this difference, that the ſnow in one was rammed down, as hard as I could, with a round piece of wood, whereas that in the other I left juſt as I found it. Round the neck A of each, well ſmeared with melted ſuet, I bound very tight with a ſpago, a freſh hog's bladder B, in ſuch manner as to make both bladders equal, and effectually prevent any air from entering into or out of the glaſſes. Before I tied the bladders on, I emptied them thoroughly of air, and faſtened them on in that condition, drawn out and flattened, ſo that if any air happened to diſengage itſelf from the melted ſnow, it could not but ſwell them, and thereby evidently prove, that there is more air contained in ſnow than in the water yielded by it. This was the ſixth of January, 1757, about nine in the morning, the air of the room in which I put the ſnow to melt, being, by means of the fire in it, heated two degrees and a half, by Reaumur's thermometer, above the freezing point; whilſt the external air, by a thermometer of the ſame kind, expoſed to the north, was three degrees under the freezing point. As to the barometer, the mercury ſtood at twenty-ſeven inches, one line and a half. I placed the two bottles near the chimney, that the ſnow might melt the faſter; and at the end of twenty minutes, I could obſerve the ſnow to give away, and both the bladders ſwell, with this only difference, that the looſe ſnow melted ſooner than that which had been rammed, and the bladder bound over the top of the former, ſwelled leſs than that bound over the latter. The ſnow on both bottles was compleatly melted at noon, when both bladders were conſiderably ſwelled, but ſtill with this difference already noticed; the bladder bound over the top of the rammed, being more ſwelled, than that bound over the looſe ſnow. I now put out the fire, and left the bottles the whole evening in the ſame room; in which the heat by the thermometer continued at two degrees and a half above the freezing point, and the mercury of the barometer likewiſe at the ſame height till three o'clock. Towards the evening the two bladders were a very ſmall matter leſs ſwelled, than they had been at noon, ſo that they ſtill evidently contained no ſmall quantity of air, of which before the melting of the ſnow, there did not appear the leaſt ſign in them. At half an hour after ſix in the evening, I placed the two veſſels without the window, expoſed to the free and open air; the weather, by a thermometer placed in the ſame ſituation, being at three degrees and a half under the freezing point, and the mercury of the barometer twenty-ſeven inches, and two lines and a half high. I did this to diſcover by the cooling of the air, whether the ſwelling of the bladder might not be entirely owing to the extraordinary heat of the room, in which I made the experiments. I left them in this ſituation till half an hour after ten, when the weather, by the thermometer, being four degrees and a half below the freezing point, the bladders were a little ſubſided, though not ſo much but that I could ſtill perceive a great quantity of air in them, enough to prevent my reducing them to the ſmall ſpace they occupied, when tied to the mouths of the bottles. This expanſion ſtill continued greater in the bladder bound over the rammed, than in that bound over the unrammed ſnow. To this I muſt add, that in this interval, the mercury roſe in the barometer, as I have already ſaid, one line; which is a further proof that the ſwelling of the bladders, was entirely owing to the air that eſcaped from the ſnow; otherwiſe, on account of the increaſed denſity of the air, indicated by the height of the mercury, after the ſnow's melting increaſed, the bladders muſt have ſunk into the mouths of the bottles. We may therefore, I think, conclude, from this, and two, in every reſpect, ſimilar experiments, performed on the fifteenth and eighteenth of the ſame month, without the leaſt viſible difference in the event, that, in the melting the ſnow, there eſcapes from it a certain quantity of elaſtic air, not unlike that which is neceſſary for the reſpiration of animals.

This therefore ſuppoſed, I endeavoured to determine by other experiments, in what quantity of this air was contained in a certain quantity of ſnow. For this purpoſe, I took a wide, but not very long necked glaſs recipient, B fig. 2. with three circles or hoops round the external ſurface of the neck. I weighed it empty, and then full of melted ſnow, of which, by that means, I found it to contain one hundred and forty four ounces. I then filled it with looſe unrammed ſnow fallen the preceeding night, and weighing it again, found the ſnow it contained to weigh but twenty-four ounces. To cloſe the mouth with greater exactneſs, I provided a cork, A fig. 3. with a ſcrew brim, three inches high, to go over the outſide of the veſſel; and that part which was to go into the recipient as deep as the ſecond ring, I ordered it to be ſmooth. I then made a hole quite through this cork, and fixed in it the barometer C. C. C. which I afterwards ſealed ſo well within and without, as to render it quite immoveable. I then ſmeared the brim of the cork, and the outſide of the neck with a mixture of melted hog's lard, ſuet, and bees-wax; and having covered the cork with a dry pork's bladder, rendered ſoft and ſupple with olive oil, I put it into the mouth of the recipient, the bladder reaching below the third ring. Furthermore, that the air eſcaped from the ſnow might neither lift up the ſtopple, nor fly off by the neck of the bottle, by making its way between the ſides of the cork and the bladder faſtened to it, I with a ſpago D. D. fig. 4. tied the bladder round the ſcrew of the cork, ſo tight, and with ſo many turns, that, let ever ſo much air eſcape from the ſnow, it could not poſſibly either lift up the cork, or in any ſhape expand the bladder; but only by being thus confined to the invariable capacity of the recipient, in conſequence of its greater denſity, raiſe the mercury in the barometer.

The fourth figure exhibits the recipient ſtopt with its cork, covered with the bladder, and tied down with the ſpago and the barometer fixed to it. On the firſt of February, at nine in the morning, the mercury in the barometer ſtanding at twenty-ſeven inches one line, or three hundred and twenty-five lines, and a thermometer expoſed to the open air, being a degree below the freezing point, and another in my room, where there was a fire, two degrees and a half above it; I placed the recipient, full of ſnow, and cloſed in the manner above deſcribed, in my chamber, at ſix feet diſtance, ſideways, from the fire. In proportion as the ſnow melted, the mercury in the barometer viſibly roſe, and by the time the ſnow was entirely melted, viz. at half an hour after eleven, had got a line and a half above the three hundred and twenty five lines, at which it ſtood in the beginning. Conſidering, therefore, the twenty-four ounces of ſnow, put into a veſſel capable of containing one hundred and ſixty-four ounces of water, that is, placed in a ſpace ſix times greater, it is evident, that the ſnow took up but a ſixth part of the internal capacity of the recipient, and that the air which eſcaped from it in melting, by filling the reſt of the veſſel, required a ſpace quintuple of that which the ſnow alone occupied. Conſequently, if the air that thus eſcaped, had but a capacity equal to that of the ſnow to dilate itſelf in, it muſt have continued five times denſer, and of courſe, five times more elaſtic; ſo that, inſtead of raiſing the mercury in the barometer, one line and a half, it muſt raiſe it five times higher, that is, ſeven lines and a half. Now, dividing the original height of the mercury in the barometer, or three hundred and twenty-five lines by five and a half, the quotient will be forty-three one-third; therefore, in twenty-four ounces of ſnow, there is about the forty-third part of its volume taken up by air equally denſe with that which we breath and live in; and which air eſcapes in the liquefaction of the ſnow, beſides what remains in the water formed by it.

The third of February, I repeated this experiment on well rammed ſnow, fallen the preceeding night, with a ſmaller recipient, containing one hundred and thirty-ſeven ounces of melted ſnow. As to the reſt, I ſtopped the recipient with a cork made on purpoſe, and bound every thing very tight, juſt as I had done in the firſt experiment, exhibited by the fourth figure. The quantity of ſnow thus got into the recipient amounted to forty-eight ounces. The heighth of the mercury in the barometer, was three hundred and twenty-five lines; the thermometer expoſed to the open air, a degree and a half; and another in the room, where there was a fire, two degrees and a half, above the freezing point. At eight in the morning, I placed the veſſel in the room at ſix feet diſtance, as before, ſideways, from the fire. About eleven the ſnow was entirely melted, raiſing the mercury in the barometer, gradually as it melted, four lines and one twelfth of a line higher than it ſtood in the beginning. So that, the whole capacity of the recipient, being to that taken up by the melted ſnow, as ſeventeen to ſix, and the air diſengaged from the ſnow in melting, being dilated into a capacity, which is as eleven, if the air thus eſcaped, had been confined to a volume, equal to the volume of ſnow turned into water formed by the ſnow, that is ſix, the riſe of the mercury in the barometer, inſtead of being but four lines and one twelfth of a line, would be in the proportion of ſix to eleven, that is about ſeven lines and a half. The heighth of the mercury in the barometer, was in the beginning of the experiment, as I have already obſerved, three hundred and twenty five lines; wherefore, dividing theſe by ſeven and a half, the quotient will be, as in the firſt experiment, about forty-three; and therefore it is plain, that the air eſcaped from the rammed, compared with that eſcaped from the unrammed ſnow, is always proportional to the water ſeverally formed by them.

Theſe experiments I repeated in the month of January of the preſent year, on rammed and unrammed ſnow, and with the ſame veſſels cloſed in the ſame manner, and the reſult of all was exactly the ſame. On the twenty-fourth of January, I made another experiment on rammed ſnow, with the veſſel containing one hundred and thirty ſeven ounces of thawed ſnow. When I put the ſnow in, the mercury ſtood at twenty-ſeven inches, but by the time the ſnow was melted, it had riſen to little more than twenty-ſeven inches and three lines. I kept the recipient at ſix feet diſtance, ſideways, from the fire in a room, in which the thermometer was four degrees above the freezing point, whilſt that in another without doors, was three degrees and a half below it. And to know for certain, if the riſe of the mercury might not be owing to the heat of the room, inſtead of the eſcape of any air from the ſnow, I moved the recipient nearer to the fire, upon which the mercury, indeed roſe a trifle; but, on the other hand, it fell again on my removing the recipient back to the ſpot where it firſt ſtood; and this alteration was, beſides, ſo ſmall, as in my opinion not to deſerve the leaſt notice, and much leſs prove, that the riſe of the mercury is owing to any thing but the elaſticity of the air eſcaped from the ſnow in melting. I placed the recipient in another room, which, according to the thermometer was cold half a degree below freezing, yet the mercury did not ſink in the leaſt, but continued at twenty-ſeven inches and three lines, the height it was at when I took the veſſel from the fire. Having weighed the melted ſnow, I found that it contained but ſix parts out of ſeventeen of the whole capacity of the recipient: wherefore (comparing, as we have done in the preceeding experiments, this denſity with that, which the eſcaped air would have acquired, if confined to a ſpace equal to that which the ſnow occupied; and expreſſing this denſity by ſeven lines and a half) as the atmoſphere, at the beginning of the experiment, kept the mercury in the barometer to the height of twenty-ſeven inches and eleven lines; ſo dividing this number by ſeven lines and a half, we ſhall have for quotient forty-three and one fifteenth; that is to ſay, that the air eſcaped from the thawed ſnow occupies, fractions neglected, the forty-third part of the ſpace occupied by the water formed by ſuch ſnow. On the 26th of the ſame month, making an experiment of the other recipient one ſixth full of unrammed ſnow that had fallen two days before, we found that the mercury, which in the beginning of the experiment was at twenty-ſeven inches five lines and a half, by the end of it had riſen one line and a half: from whence we may draw the ſame concluſion as from the preceeding experiments, that is, that air eſcaped from ſnow in melting is, in bulk, omitting fractions, the forty-fourth part of the ſaid ſnow reſolved into water. I could not make any more of theſe experiments this year, as there did not fall any more ſnow in Turin, except towards night-fall on the 20th of February, and on the 25th; the firſt in very ſmall quantities, and the ſecond mixed with a great deal of water, by which it was preſently diſſolved. Now by the meteorological obſervations I have made during the laſt ſeven years, the greateſt height of the mercury in the barometer has been twenty-ſeven inches and ten lines, and the leaſt twenty-ſix inches and five lines; therefore the quantity of air eſcaped from the thawed ſnow, compared with the greateſt height of the mercury will be $44\frac{8}{15}$, and with the leaſt $42\frac{4}{15}$.

Now, whether this air mixes with the ſnow, while that ſubſtance is forming, or externally adheres to it in its fall; whether the quantity of this air be greater or leſs, according to the greater or leſs denſity of the atmoſphere at the time of its falling;

or whether, in fine, it abounds more or leſs according to the diſpoſition it meets in adhering to, and mixing with the ſnow, are things I have not enquired into. It was enough for me to prove evidently, that ſnows contains air, and in no ſmall quantity, ſo as to be thence able to account for Mary Anne, Anne, and Margaret Roccia's living ſo long in a place, entirely deprived of all freſh air, except what might in the beginning penetrate through ſome long, narrow, and winding paſſages, the immenſe heap of ſnow under which they lay buried, and did moſt certainly penetrate it, in proportion as the weather mended, and the ſummer advanced; as is plain by the falling away of the valanca, and the extraordinary looſeneſs of that part of it neareſt the earth. I have ſaid, *live*, becauſe, as I have already obſerved, they ſuffered vaſtly in point of reſpiration; and the great weight, which from time to time they felt upon their cheſts, and which they thought themſelves obliged to lift up in reſpiration, ſufficiently demonſtrates, that, though the circumambient air they breathed, had elaſticity enough to keep them alive, it was not, however, of ſuch a quality, nor in ſuch a quantity, as to be able to dilate their lungs as uſual in a wholeſome and natural ſtate; and of courſe raiſe with equal facility and liberty, the cheſt containing theſe organs.

All that now remains to make an end of this diſcourſe, is to give ſome account of the manner in which they have lived to the preſent time, and what ſtate of health they actually enjoy. On their return from the baths of Valdieri to Bergemoletto in the month of July, Joſeph Roccia, enabled by the charitable contribution of his majeſty, and his royal highneſs the duke of Savoy, built himſelf a new little houſe about forty paces diſtant from that which the valanca had demoliſhed. Here with the aſſiſtance of the two loving goats, which had preſerved the lives of his wife, daughter and ſiſter, and the little ſtock the two laſt, himſelf and his ſon, could with much fatigue lay up in the ſummer, they all made a ſhift to paſs the following winter. At the return of ſpring 1756, Anne and Margaret returned to their field labours; but Mary Anne, by reaſon of the tremor in her eyes, and the pains in her legs and knees, was obliged to ſtay at home, and confine herſelf to the within-door work of the family. As they found it impoſſible to provide in ſummer, a ſufficient ſtock to laſt them the winter, Mary Anne, and Anne, in company with Joſeph, ſet out in a very poor plight from Bergemoletto, towards the end of December, and making, on foot, the tour of Piedmont, by the piteous recital of their long, and great ſufferings, excited ſo much compaſſion, that they every where met with a charitable reception, and plentiful relief. They came to Turin, where I ſaw them, the 17th of January, 1757, tired and fatigued with their long and painful journies, but in a good ſtate of health, all to Mary Anne's ſtill complaining of the tremor in her eyes, and a great dimneſs of ſight. Three days after they purſued their journey through the towns, villages, and gentlemen's ſeats, which they had not yet viſited, and at the end of March returned home to ſee Margaret and John, the only children left of ſix which Mary Anne brought her huſband, and content with the generous contributions their melancholy tale had every where procured them. In April, the three ſtill enjoying perfect health, returned to their uſual field-labours, and have ever ſince continued to lead the ſame life they did before their misfortunes; and with the ſame degree of health and ſtrength, all to Mary Anne's ſight growing worſe and worſe from day to day, ſo as to give but too much room to fear that ſhe will at laſt entirely loſe it.

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